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E PSYCHOLOGICAL CLINIC

A Journal of Orthogenics
For the Normal Development
of Every Child

Psychology **Hygiene** **Education**

Editor:
LIGHTNER WITMER, Ph.D.,
University of Pennsylvania

VOLUME XII.
1918-1919

THE PSYCHOLOGICAL CLINIC PRESS
PHILADELPHIA, PA.

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VOL. XII, NO. 1
MARCH 15, 1918

THE Psychological Clinic

For the normal development of every child

PSYCHOLOGY HYGIENE EDUCATION

Editor: LIGHTNER WITMER, Ph. D., University of Pennsylvania

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THE PSYCHOLOGICAL CLINIC PRESS
WOODLAND AVE. AND 36TH ST.
PHILADELPHIA, PA.

PRICE TWENTY CENTS

THE PSYCHOLOGICAL CLINIC

A Journal of Orthogenics

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PSYCHOLOGY HYGIENE EDUCATION

Subscription price, $1.50 per annum (nine numbers). Single numbers, 20 cents. Canada postage, 10 cents extra. Foreign postage, 20 cents extra.

Published monthly except July, August and September, by Lightner Witmer, College Hall, Woodland Avenue and Thirty-sixth Street, Philadelphia, Pa.

Entered as second-class matter February 12, 1908, at the post office at Philadelphia, Pa., under the Act of Congress of March 3, 1879.

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THE PSYCHOLOGICAL CLINIC PRESS

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The Psychological Clinic

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VOL. XII, No. 4. JUNE 15, 1918

ORTHOGENIC CASES XIII: OBADIAH, A CHILD WITH A NUMERICAL OBSESSION.

BY SARAH WARFIELD PARKER, A.M.,
Philadelphia, Pa.

In the strangeness of a new school and a new home, Obadiah stood aloof, watching—and counting. To him, it was a peculiar community—this one in which children did what they were told, and a curious house, too, where a shrill shriek of "When's Obadiah going to get his pie?" brought no response. So he watched with large grey eyes, and, because he could not help it, he counted, with swift, furtive movements of the lips, the chairs in the room, the roses in the border on his plate, the raisins in the pudding, the scallops on his doily, everything that could be translated into number.

With the children he felt no consciousness of kind. Sometimes he walked among them stiffly, holding his body as though his spine were a steel rod inclined a little backward. Oftener, he simply stood, a small, somber figure in a grey striped suit, with a round well-shaped head set low on narrow shoulders, with fine, straight hair of the brown which blends into grey, and with a skin that was without color and soft to touch. He was not yet six; yet he never played, he never ran. As he stood with the children, solemn, drab, and stiff, you could amost visualize the circle which set him apart from the others, so that they rarely spoke to him or he to them.

The adults in the house at first possessed for him but few attributes. They were moving objects who made him obey, who presented him with food, and who wore wrist watches. He spoke to them only to announce his immediate movements: "Obadiah's going to take a little west. Obadiah's going to west till ten minutes of six, one hour and fifty minutes"; or to demand with a frantic grab at the watch: "How many minutes till supper?" At such times he often broke into hysterical protest: "When's Obadiah going to have his supper? Supper's at six-firty. It's twenty-seven minutes of seven. Supper's free minutes late. When's Obadiah going to have his supper?"

Inanimate objects, except as he counted them, crossed his threshold of consciousness even less effectively. He could not dress, nor attend to himself at toilet. He did not try to put on his hat, coat, or gloves, or to take them off. He did not touch things about the house, or on the playground. He never looked at a book except to count the pages. The only toy he noticed was a velocipede which he took sober pleasure in riding solemnly round and round. How little he saw on a walk and how much less he could express is suggested by a dialogue recorded in the first month he was with us.

"What did you see on our walk today?" he was asked.

Obadiah whispered the echolalic response, "On our walk today."

When the question was repeated, he started the absurd monotonous chant he used so often to avoid the trouble of thinking about subjects which did not interest him: "Somefing,—nofing."

A third insistent repetition drew the response, "A church."

"What else?"

"A chicken."

"What color was the chicken?"

"Blue," in a thin chanting monotone.

"What else did you see?"

"About free fings," in the same swift monotone.

"You've told me only two. What else did you see?"

"Bricks."

"Anything else?"

"About six fings."

"Then what else did you see?"

"You saw a sight."

"What did you see?"

"A sight."

To music alone he responded with evident pleasure. He would bring a stool and sit motionless, close to the piano, listening.

The world, for Obadiah, seemed to consist, not of a varied complex of environing stimuli, but only of a few pleasing sounds to be listened to, a few substances to be eaten, and many, many objects to be counted. Of all that could be numbered, he found minutes most fertile in possibilities for novel and infinite calculation.

This was our first impression of the curious, and as we came to to know him, the winsome, child whom we had with us for six months' training and observation.

Although his age was less than six, Obadiah could number this school as his fourth. The winter after his fourth birthday, six weeks in a Montessori school started the misapplication of that method in his own home. The next autumn, while he attended for two months a church kindergarten in Elizabethtown, his grandmother, with the grim aid of a stick, tried, with only temporary success, to mend the result of the year in which, by hysterical outbursts and consistent heedlessness of commands, he had run his own undisciplined way. Now, in the succeeding winter, Obadiah had been dropped from one of the best of the city special classes because he never obeyed and because he spent most of his school time in screaming and yelling.

Because of this malconformity in behavior which made it impossible to teach him with his fellows, and not because of his extraordinary talent for number, Mr. and Mrs. F. had brought their perplexing son to the Psychological Clinic. The curious concentration of this six-year-old upon number, however, and his consequent abstraction from other performances, were conspicuous from the moment that Obadiah, in a prim white suit, first stood in the laboratory, one February day, rapidly counting the windows before he put his first characteristic question, "How many floors has this school?"

It was apparent in his reaction to every test. With space perception adequate to the task, he replaced all the blocks in the Witmer formboard, but it took him 76 seconds to do it the first time, for he worked excitedly, with his attention on other things, and remarked as he finished, "Eleven blocks. Eleven people were at the house this week." In the cylinder test, at first, he played idly with the blocks, and repeated the examiner's directions with persistent echolalia. After he had placed four of the eighteen blocks by the trial and error method, often attempting to jam a large block into a small hole, Obadiah stopped work to count the recesses. To the examiner's command to get back to work he replied with the statement, "You have fourteen more blocks."

Since, therefore, this child who had never been taught arithmetic, fixed his attention so obstinately upon number, Dr. Witmer gave him a few problems, "If you take five away from eighteen, how many will you have left?" was the first.

Obadiah began to count rapidly, "17—16—15—14—13, firteen." he announced.

On five similar examples in simple subtraction, he made no mistake.

"Take two away from forty-five."

Obadiah counted with swift movements of his fingers. "44, 43, forty-free."

"Take twelve away from forty-five."

Obadiah counted as before: "45—44—43—42—41—" and so to 32, announcing at the end, "firty-two," his first error.

The pegboard, too, with thirty-six holes arranged in rows of six, excellent material for calculation, held Obadiah's attention for some time.

"How many holes are there in this board?" Dr. Witmer asked him.

"Free: six," Obadiah began, counting the first row by threes. "Twelve," he continued, either mentally adding the next six, or counting the second row with such swiftness as not to be apparent to the observer. Thence, he counted by ones very quickly to thirty-six, never touching the holes, and keeping his attention upon the discrete units to be enumerated with remarkable persistence and analytic concentration.

After Obadiah had pushed three of the pegs into the holes, he was asked, "Now how many holes are empty?"

The reply was instant, "Firty-free."

When all of the pegs were placed, Dr. Witmer covered five of the rows, leaving only one row of six holes exposed.

"How many sixes are here?" he asked.

"One six," answered Obadiah, understanding the question without explanation.

Dr. Witmer removed the cover, exposing the entire board. "How many sixes are here?"

"Six sixes."

He pointed to the board, asking, "How many are two sixes?"

Obadiah made a swift silent calculation, "Twelve."

"Three sixes?"

The child counted from twelve to eighteen.

"Four sixes?"

He counted in a bored tone to twenty-four, and similarly to "firty," and to "firty-six."

By this time, he was tired of the performance, and broke away to run up the steps, counting them as he mounted. An hysterical giggle and an excited racing about the room was his reaction to the command to come back. Commenting upon this behavior, Dr. Witmer remarked that never once thus far during the examination had Obadiah obeyed. The child had merely been maneuvered into quietness by plying him with work which he liked to do.

At length Obadiah was lured back to his place by a picture book, but was listless, inattentive, erratic. A cat he called a chicken in a sing-song tone, and deigned to answer correctly only such questions as, "How many feet has this horse?" He was held in rein with the utmost difficulty till one of the examiners left the room. Then, almost reflexly, he broke into one of the hysterical shrieking monologues in which he invariably referred to himself in the second or third person. He jumped up and down, and struck his crimsoning face with a grimy fist, screaming, "Where's that man? Where's that man? Now you're going home. Now the man's coming. He's coming Sunday. Who's coming Sunday?"

Dr. Witmer, in an attempt to divert him along the line of his interest, handed him the pegs to count.

Obadiah, pushing them away, shrieked irrelevantly, "Mrs. Peter's went over to her room. Where's John?"

An insistent question, "How many pegs did you count on the board?" however, brought out of the wild screaming, the surprisingly accurate recollection, "Firty-six."

"How many feet has the horse?"

"Four," he wailed.

"A pig has four feet. How many feet have three pigs?"

"Twelve,—twelve feet," yelled Obadiah.

Obadiah's attention was now caught, and in response to Dr. Witmer's quiet, emphatic repetition of his command, he jammed the pegs into place with an excess of energy, crying all the time, "Be a good boy. Den you're going home."

"Now take them all out again and then you *may* go home." Dr. Witmer commanded.

Obadiah snatched at the pegs frantically, still shrieking, "Den you're going home."

So, with tear-stained, grimy face, and a rumpled Sunday suit, Obadiah left the clinic on the first day.

Two days later he came again, white, immaculate, and solemn.

On this second afternoon, he proved himself as good an arithmetician as ever. The six table he had forgotten, but worked it out again rapidly from the peg board. Of course untaught, he could not tell how many were eight sixes, and one would not expect that Dr. Witmer's direction to "add two more sixes to thirty-six" could mean anything to a six-year-old. Obadiah, however, swift to catch from the slightest clue a method of calculation, counted immediately by skips and jumps from thirty-six to forty-eight, using no check but the nervous weaving of his fingers.

For the performance tests, and for objects presented to him for observation and identification, he cared no more than on the previous day. After he had put the blocks in the formboard in fifty-seven seconds, he would have nothing further to do with the board. With the Witmer cylinders, he fooled aimlessly, talking all the while; "Where's grandmuvver? Is grandmuvver taking the train?" Five of the wooden block letters he named several times but afterward often miscalled them. When left to himself, he arranged these letters in a precise row, murmuring, "That's Firty-fourth. That's Poplar St. That's Twelfth and Susquehanna. That's Tenth and Diamond. That's the bridge. Sit dere. Broke his leg off. Broke his leg off. Mrs. Peters did." All the time his arms and legs wriggled and his face wrinkled nervously. He refused to look at pictures, till the glimpse of a sheep started him off on "Heavenly Favver, great and good, we fank vee for our daily food."

After much uneasy wriggling, and resistance to both command and decoy, Obadiah suddenly dodged and ran to his father, yelling, "Safe journey. You buy croquettes on Glenecke." At Dr. Witmer's request, therefore, both parents left the room. Their going, as was expected, precipitated precisely the sort of scene which had made it impossible to keep Obadiah in the special class. For one half hour, Dr. Witmer held him firmly between his knees, while Obadiah yelled in a high sing-song,—

"Where's muvver? Favver and muvver didn't go home. You will be a good boy. After a wh-i-i-le, after a wh-i-i-le. Where did favver go? Downstairs, downstairs. Obadiah close his eyes and den Dr. Witmer goes away. He *does* go away."

Gradually Obadiah's shriek was modulated to a chant. He intoned his repetitive phrases as though the release of that much energy in a volume of sound gave him extraordinary pleasure.

"Dr. Witmer will go out. Den you'll be favver's boy. Grandmuvver's gone to Elizabethtown. Where's favver? After a wh-i-i-le, very soon, very soon, next Monday. Dr. Witmer's going away. Muvver's gone to the Ladies' A-A-A-id, muvver's gone to the La-a-a-dies' A-A-A-A-id. Grandmuvver's gone to Elizabethtown. Let's a-a-ll go to Elizabethtown."

At the end of a little space of quiet, Obadiah continued, alternating rapidly between resentful bawling and a smiling yodel, "Muvver and favver went in dere. They did. The bridge isn't at Ninth St. They went to Firty-fourth St.—they did. The bridge is right here. They did go under the bridge. What's Obadiah going to have for his supper?"

These long and resonant wailings gradually died away till Obadiah became calm enough to put the pegs in the peg board. As he worked he sang, "And den the long while will be up. When's Dr. Witmer not going to have you? After a wh-i-i-le, after a while. The bridge must be at Twelfth St. Finish your job. Den Obadiah's going home."

This hopeful chant was broken into by Dr. Witmer's unpleasant statement, "No, then I'm going to give you another job."

Obadiah did not protest. Instead, he sang out, "Dr. Witmer's going to buy another job at Wanamaker's."

"Where is Wanamaker's?" Dr. Witmer asked.

"At Twelfth St.," Obadiah chanted.

"At Twelfth and what?"

"Twelfth and Market," sang Obadiah.

"It's at Thirteenth and Market Sts.," Dr. Witmer corrected.

Obadiah, without remark, went on with his work, but as he pressed the last peg into place he said tersely, "It's at Firteenth and Market St."

The child was now in fairly good rapport for work. His actions seemed, for the first time, subject to the will of the examiner, and the direction of his attention determined somewhat by another's suggestion, and not wholly by his own obsession. He would now give his attention to the colored pegs, and showed adequate discrimination for the four colors,—red, yellow, green, and greenish blue. The calm of exhaustion, and this new acquiescence in work which was not numerical, was disturbed only temporarily, when Dr. Witmer's withdrawal, which had been so hopefully anticipated in the earlier lamentations, brought from Obadiah wails quite as loud, if not as long, as had the disappearance of "favver" and "muvver." When this last outburst subsided, he showed some slight interest in the design blocks—enough to learn by patient teaching and urging to construct the "checked square," to turn the proper surfaces for the "square within a square," and after first making a diagonal stripe instead, to place correctly, with some urging, the two upper blocks of the square. Then, when the examiner looked away, he quietly reached over, and stole the two lower blocks from the pattern she had set, and placed them to complete his own.

Exhausted by his futile lamentations, Obadiah had yielded to the native suggestibility which, no less than the hysterical resistance, was inherent in his nervous, overwrought organism. Types of behavior are determined, in part, by the mutual adaptation which is constantly taking place between the human organism and its environment. In the laboratory, Obadiah found an environment which remained constant in spite of the vociferous assault he made upon it by the method which had succeeded so well at home. Since the environment would not change, his behavior must. Two weeks later, therefore, a quieter and more obedient child appeared before the clinic class.

Instead of breaking into lamentation, Obadiah repeated Dr. Witmer's direction to his father, "Favver, go down stairs," and, as he watched the door close, remarked laconically, "Favver went downstairs." Objects and animals, he named, not always accurately, since he called apples "cranberries," but well enough to eliminate the suspicion of name aphasia as a factor in the meagerness of the ideas he expressed. In subtracting he was less accurate than on previous days, but he recalled the six table over the two weeks' interval without further coaching.

He gave, on this afternoon, a demonstration of his unusual capacity for persistent concentration when his attention was occupied with the manipulation of numbers. Dr. Witmer asked him, "How many are twelve from forty-six?" As Obadiah started to count backward Dr. Witmer interrupted with a second question, "How many pegs are there in the board?" Obadiah stopped his count just long enough to reply, "Firty-six," and without confusion, continued his subtraction till he arrived at the proper answer to the first problem, "Firty-four."

In these three successive examinations in the month before he came to us in the country, Obadiah thus showed himself to be a child with a distinctly abnormal behavior, an hysterical organism capable of modification by discipline, a marked numerical obsession, and a genuine congenital aptitude for arithmetical processes. The quality of this latter talent, implying, as we have seen, the possession of considerable persistent analytic concentration of attention, certain specific memories, and, within a narrow range, logical association and a capacity for synthesis, was such as to make tentative the diagnosis of high grade imbecility which would otherwise have been given positively on the basis of Obadiah's general inefficiency and abnormal behavior.

This analytic diagnosis, it will be observed, was made, not on the basis of any "point system" for measuring intelligence, but as the judgment of trained psychologists upon their total observations of the behavior of the child. At the time of these clinic examinations, this behavior was too erratic and undisciplined to make possible, even if it had been considered essential, the giving of a series of tests such as the Binet Scale. The rating of Obadiah's response to the Stanford Revision of the Binet Scale three months later, when "educational rapport" had been established, strikingly illustrates how, in certain exceptional cases, the indiscriminate acceptânce of the technical rating might lead to a false diagnosis. The Mental Age of 5 years and 6 months, and the Intelligence Quotient of 91.6, which, according to rule, would place Obadiah well in the normal group were not a valid index of his general intelligence level. In this case, the significant factors to be considered in interpreting the results were the very wide distribution of his successes between a basal age of 3 years and a terminal age of 9 years (3 years+ $\overset{\text{IV}}{\text{10 mo.}}+\overset{\text{V}}{\text{2 mo.}}+\overset{\text{VI}}{\text{6 mo.}}+\overset{\text{VII}}{\text{8 mo.}}+\overset{\text{VIII}}{\text{2 mo.}}+\overset{\text{IX}}{\text{2 mo.}}=$ 5 years and 6 months), the crazy, hysterical manner in which he responded to many of the tests, and the fact that the mental capacities which weighted his low basal age of 3 years to a normal level were chiefly his abnormal numerical ability and his subnormal subjection to the habit of echolalia.

Obadiah's specific talent easily won him credit through the higher levels by his successes in counting objects, in reciting lists of days and months, in naming coins, in numbering his fingers, and in repeating digits up to 5 digits forward and 3 backward. He did not, however, know the value of the stamps, nor seem to understand the situation in the problems of making change, though in the same week he solved mentally problems which appeared to demand as high a degree of comprehension.. The condition of uninhibited reflex discharge between the auditory apperception of words and the speech mechanism also gave him credit in the repetition of sentences up to 16–18 syllables.

On the other hand, the hysterical inability we had observed in him to choose between two alternatives made Obadiah fail on all the tests of discrimination. He made no choice even when he seemed to make the discrimination, as in the case of the two lines which, with his curious interest in estimating length and quantity, he measured carefully with two fingers spaced as a one-inch rule. With the lines, the weights, the choice between right and left, and in aesthetic comparison, he merely sang in a high key, "This one,—that one,—this one,—that one." In comprehension, and in the description of pictures, he barely passed at the 3 year level.

What must you do:
when you are sleepy? "Go to sleep."
when you are cold? "Go out." Why? "Because you play."
when you are hungry? "Eat."
if it is raining? "Play out."
if you find the house on fire? "Burn."
if you miss your car? "Somefing. Nofing."

In two pictures he enumerated three objects with an erratic, staccato inflection; there was no indication of even the beginning of an impulse to describe. In the mutilated pictures he saw nothing at all lacking. Because of deficiency in expression, he fell short, too, of passing the definition test.

Chair. He pointed to a chair but would say nothing.

Horse. He pointed out of the window, saying, "A horse is out dere—what you go on a pony ride."
Fork. "To eat,—to put it away."
Doll. "A doll,—a baby doll. It's a doll."
Pencil. "To write."
Table. "It's on the table. It's downstairs where we eat."

This test made upon a child we knew and studied is an instance to point the conclusion that some qualitative analysis of the responses and the consideration of the type and distribution of the successes is as essential to the correct interpretation of the results of a Binet Test as the computation of the technical Mental Age and Intelligence Quotient.

In the school, Obadiah found the same inflexible environment that he had encountered at the laboratory, and quickly responded to it. In the tone of his mother's coaxings and tentative commands, he had caught instinctively the suggestion of the disobedience which she had come, half tearfully, to expect. To the implication of a command given with the expectation of obedience he reacted quite as consistently, so that this child who had baffled father, mother, grandmother, and teachers, almost at once responded with Teuton alacrity to the voice of authority irrespective of its source. The imperious commands of twelve-year-old Joan he sometimes obeyed even more implicitly than the milder directions of a teacher, and again and again, he climbed down promptly from his own velocipede when three-year-old Jimmie said peremptorily, "Get off." Deliberate refusal to obey directions practically disappeared inside of a week. Sometimes he would declare rebelliously, "Obadiah's not going to jump anovver time," but he always did.

Of course, Obadiah did not become a model child overnight. There were a few important points upon which he held out. For instance, he had decided views upon the diet proper to his constitution—no milk, no cereal, few vegetables, a great deal of pie and fruit, and eggs only when scrambled. To the surprise of his parents, he accepted with good grace, after a fortnight's struggle, a menu which did not respect this diet list. On one point alone Obadiah won out. The heart of no teacher was stony enough to withstand the appeal of the wrinkled agony of his scarlet face, as, morning after morning, he tried to swallow a boiled egg.

His convictions upon the promptness with which meals should be served were quite as decided. If supper were two minutes behind schedule, he screamed and jumped hysterically. Five long, agonizing minutes of sitting quietly upon a chair while he listened to the tempting sounds of other children already eating in the next room followed each outburst till he learned that such scenes postponed rather than hastened "Obadiah's supper." Therefore, he usually repressed the demonstrations of his impatience, although whenever a meal was delayed he could not conceal the nervous restiveness with which his whole organism fairly fluttered. No matter how early we started on an afternoon walk, he was tormented with a frantic fear that we would not return in time for supper. With an air of, "Let's get this over as soon as possible," he trudged along steadily, and if we stopped to pick flowers, or to sit by the creek, he could scarcely repress his nervous, shrieking protest. When, at last, we reached home he would run ahead of all the children through the opening in the hedge, and as the teacher followed him up the wide, white steps, feel for her wrist watch with fluttering fingers.

"It's quarter of six. You've been out how long? You've been out since quarter of five. You've been out one hour. You're going to eat supper in a quarter of an hour—no,—more,—supper's at half past. In free quarters of an hour Obadiah's going to eat supper. Free quarters of an hour is forty-five minutes."

This hysteria over the meal hour was not due to hunger or to his love of food, but to a strange passion for promptness, and an obsession for computation. Once, when Obadiah was sick in bed, his dinner tray was brought to him at ten minutes of one. He refused to touch it before one o'clock, the scheduled hour for dinner. Obadiah always welcomed his father with the cordial question, "What time is favver going?" He spent the visit in computing the constantly decreasing interval, so that the moment of separation brought from him, not a wail of protest, but a sigh of relief from the tension of suspense.

Whenever Obadiah went upstairs to take a "little west" the conversation was limited strictly to hours and minutes. "Free o'clock," he said, "How long is Obadiah going to west? Two hours and fifty minutes?" When he was called, he remarked, "Obadiah's getting up at five o'clock. Two hours. Yesterday you got up at ten minutes of six." On the ninth day of May he announced, "You've been here fifty-seven days,"—an absolutely accurate statement.

Because of the nervous imperiousness which this passion for computation had roused in him, we tried rather futilely to keep material for calculation away from him. Nevertheless, one afternoon at rest hour,—on the tenth of April,—I yielded to the temptation to try Obadiah out on a problem that I thought would "stump" him. I was also curious to find out whether he had any idea of counting above a hundred.

It was five minutes after three. I showed him my watch and said, "You are going to rest until half past five. How long is that?"

"Two hours and a half," he replied, making an error of five minutes.

"How many *minutes* will that be?" I asked.

Obadiah ran his fingers rapidly round and round the dial, counting by *fives* in a half whisper. "One hundred and sixty minutes," he answered, after a little.

"You are wrong, Obadiah." I said.

Obadiah returned to the problem, not failing to note without suggestion that two minutes had elapsed during the previous calculation. "Seven minutes after free," he murmured; and then he counted round the dial, this time by *tens*, to 160, and thence backward rapidly, 159—158—157—to 153, "One hundred and fifty-free minutes."

The correct answer, of course, was 143. "Try again," I urged.

Before he completed this third count it was ten minutes after three, so that his answer, "one hundred and forty minutes," was correct.

This problem really hit Obadiah's intelligence level. He had to think, and to think hard to solve it, but given time and trials enough he was able to do it. On the twenty-fourth of May, before the clinic class at the University, Obadiah made a similar calculation.

"What time is it by my watch?" Dr. Witmer asked him.

"Eight minutes after two."

"When do you have supper?"

"Six-firty."

"How many minutes is it to supper, then?"

After an inaudible calculation, Obadiah said, "Four hours and twenty-two minutes."

Dr. Witmer was about to pass on to other work when Obadiah continued, "How long is four hours?"

"All right, go ahead." Dr. Witmer encouraged him.

"Four hours, 240 minutes," said Obadiah after an interval.

"And how many minutes altogether?" asked Dr. Witmer.

"Two hundred and sixty-two."

It was difficult, too, to keep the other children from exploiting Obadiah's talent. We had had no indication that he understood the concepts of seconds or of halves, or the principle of division. Just before supper on the twenty-ninth of May, one of the older boys was heard to ask Obadiah, "How many minutes in 120 seconds?"

Obadiah answered without hesitation, "Two minutes."

"How many seconds in ten minutes?" William continued.

"Six hundred."

Joan broke into the dialogue, asking a question she could not herself answer,—"How many *half* seconds in ten minutes?"

Almost immediately this astonishing child replied, "Twelve hundred."

I give the dates of these conversations because it is my opinion—one which it is obviously impossible to verify—that in February at the laboratory he could not have solved problems of such complexity. I believe that in spite of our efforts to suppress his impulse to count and to calculate, by virtue of incessant exercise and his ability to acquire the application of a new method from a single illustration, Obadiah's performance level in numerical processes was rising with extraordinary rapidity.

It is small wonder that, with his mind so persistently occupied with numbers, he was receptive of little else in his environment. To questions that did not have to do with number or food, it was difficult to get from him anything but random answers. This was due, not so much to incapacity to understand or to perceive, nor to deficiency in attention, but, I believe, to his failure to *direct* his very excellent faculty of attention to objects other than number.

When Obadiah was asked, "Obadiah, where are your garters?" he sang vaguely, "Over dere."

"Where *are* they, Obadiah?"

"Downstairs—downstairs."

"Nonsense, *where* are they?"

Thus stimulated by repeated questions to attend to the matter in hand, he clutched frantically at his trouser leg, exclaiming, "In here," and shortly pulled them out at the bottom.

Once he forgot to take off his sweater.

"Obadiah, what have you on that you don't wear in the house?"

"Somefing."

To a repetition of the question, he answered, "Nofing."

"What have you on that you ought to take off?"

"Pants," in a sing-song tone.

At length, he said "Sweater," whereupon he took it off, carried it over to the hat rack, and laid it on top of his coat, ejaculating under his breath, "Dere."

Once he wandered out of bounds."

"Obadiah, why did you go into the front yard?"

"Because you were in the front yard."

"WHY were you there?"

"Because you asked Kafryn what time it was."

"Yes, but WHY?"

"Because it was ten minutes of eleven, because John is in that room, because it was about one minute ago."

If he chanced, on the other hand, to be interested, he could reply very precisely.

At the dinner table Miss M. removed a seed from a Malaga grape and gave the grape to Obadiah.

"What did I give you, Obadiah?" she asked.

"A grape wiv one seed gone."

Ordinarily, however, his conversation was no more coherent than the following dialogue:

"When is your birthday, Obadiah?" (It was in June.)

"December fifth," he answered promptly, but vaguely.

"The fifth of December?" in a tone of surprise.

"No, the first," said Obadiah.

"Oh, December first."

"No," he shifted with a silly giggle, "December *last*."

"What did you do on your birthday?"

"Played wiv toys, twelve toys, twenty-four toys."

"What else did you do?"

"Took a little walk with favver to the Christmas tree."

"What was on the Christmas tree?"

"Two leaves."

Nevertheless, nervous, incoherent, obsessed by number though he was, during the spring there was some slight change in Obadiah in the direction of normality. With the fresh air of which he had had little, and the wholesome diet which he had refused at home, his pale cheeks grew pink, and his thin, soft-skinned body plumper. In the first twelve days he gained a pound and a quarter in weight, and something, too, in energy. He would take off his outdoor clothes including rubbers, and undress himself at night. Never, however, did he learn to put his clothes on. On the playground, he watched a little less, and moved about a little more. He could not skip or hop, but after a little, he would sometimes run in a funny, stiff, feeble way. Though he did not play he began to "mix" with the children. He liked to swing with Joan, to be tossed about by William. Once, when little Jimmie was playing horse, Obadiah straddled a stick solemnly, and walked up and down, with the remark, "Obadiah's horse is going to Philadelphia." Still, he took no part in active play. He could not even learn readily a simple game of catch with a ball. Each time he tossed the ball *up* instead of *out*, so that it always fell beside him. He could not hit the trunk of a large tree from a distance of twelve inches. Instead of catching the ball he would hold his hands up close to his chin to fend it off, as though afraid it would hit his face. He never ran after the ball when it rolled away unless he was explicitly told to do so, and then often threw it in a direction that was altogether away from the person with whom he was playing.

It was an evening early in May that I first saw Obadiah play with something, a toy balloon we had brought him from the circus. The crimson ball was large enough for him to catch easily in his two weak, baby hands, and so light that he had no fear of its touching his face. The game was pure pleasure. With the bright, floating ball, he got the forward throwing movement without trouble. If he failed to catch it in his turn, he would scramble after it, come back to his place all by himself, and toss it again to his partner. He played with it thus, gleefully, till half after seven, when the air came out of the balloon with a low hiss. With keen interest, Obadiah watched me blow the air into the limp red bag, and saw its resurrection in a somewhat smaller ball.

The next morning, soon after eight, the red balloon tumbled into my lap over the top of the morning paper, and an eager, pink-cheeked Obadiah peered round the newspaper, hoping to lure me into another game. Yet even at the moment of this new and fascinating play, he relapsed into a characteristic soliloquy: "About fourteen hours ago I" (he always used the first person to designate the person addressed and reserved the second person for reference to himself) "I put the air in your balloon again. Yesterday you lay down at ten minutes after two. You got up at half-past five. Ten minutes after free, ten minutes after four, ten minutes after five, free hours. Free hours, one hundred and eighty, 180—190—200, two hundred minutes. You lay down two hundred minutes."

In the schoolroom, Obadiah was an extraordinarily difficult child, not because he offered any active resistance, but because he would not put his attention upon any task, and so failed to use the mental capacity he possessed.

On the morning of March 14th, the day he first came into our household, he seemed quite unable to put together a simple sliced animal of three pieces—a cow. He put the W strip directly beneath the C strip, and ignored the body of the animal altogether. Miss B. showed him carefully how to place the three strips, calling attention to each part, but Obadiah again slid the pieces into random position with legs at the top of the picture, and the truncated head at the base. Three days later, when his response to the atmosphere of quiet discipline made his reactions more controlled, he put the cow and the cat together in less than one minute each, and the horse with its five strips a little more slowly. He copied, too, several four-block designs quite readily. This work Obadiah did in a bored and disinterested manner as though he were submitting to the inevitable. Gradually, however, interest in counting the number of animals he had put together developed in him a salutary pride in accomplishment. Two weeks later, as Miss B., after a half hour's absence, opened the door of her room, a little drab figure scrambled up from the floor, a bit flushed, to make the proud announcement, "You put twelve animals *togever*." These included long and difficult animals like the kangaroo, the squirrel, and the elephant; yet Obadiah, who, at the University, unwilling either to look or to think, had called a cat a "chicken," could name them all, and would not only put them together separately, but sort out the pieces when the entire dozen were mixed in a scattered pile. He worked quietly unless, for a moment, one piece seemed to be missing; then he burst into loud screams, "Where is it? Where is it?"

Obadiah also learned to put picture puzzles together much more quickly than his first performance led us to expect. Miss B. gave him seven of the large pieces in the Little Boy Blue Puzzle. He disregarded the picture entirely, put the feet where the head belonged, and after working away for fifteen minutes by trial and error, leaving a piece wherever its form would permit it to fit, he showed no improvement. This was on the 21st of March. The next day he put three pieces together properly, and after four trials, all seven, but he would do this only when told to pick up each separate piece. After daily practice, he was able, on the 27th of March, when continuously urged, to complete the whole puzzle of fifteen pieces. In the next two days he added Little Red Riding Hood to his repertoire. By April 30th, spurred by his ambition to make his list of successes longer, he put three puzzles together without help. He also condescended, to string colored beads, because he could count them as they slipped over the needle.

To teach Obadiah to read was of the first importance in his school work. In the two weeks just before he came, his father, by a piece of very successful teaching, had taught him to name all but four of the capital letters, and all but five of the type letters. Nevertheless, Miss B., who has had splendid experience and success in teaching very young and very backward children to read, declares that with the exception of two low-grade imbeciles who could not be taught to read at all, Obadiah was the hardest child she ever tried to teach. He was utterly bored, would not look at the book unless his attention was recalled to each separate word, refused to look at a three letter word long enough to spell it, flinging out a random guess after a mere glance, and showed no sign of associating any meaningful mental content with the words. In a slow, dull, colorless monotone, constantly goaded by, "Go on. Say the next word," the reading dragged along, dispiriting mechanical drudgery to both pupil and teacher.

Four weeks from March 19th, the day on which he first learned the word MAN and on the following day hopelessly confused it with RAN, Obadiah read at the University in a demonstration before the clinic class,

"I—see—a—can."

"Spell it," said Dr. Witmer.

"C-A-T, Cat."

"What's the next word?"

"S-E-E, Me."

"S-E-E doesn't spell ME. It's SEE. What's this word?"

"R-A-N, Ran."

"It isn't N. What is that letter?"

"R-A-T. Rat."

On the sixteenth Miss B. wrote in despair, "I must have gone too quickly in reading for Obadiah. He is now up to the eighth page in Monroe's Primer, but it isn't possible to be more confused than he is over the nine words he has learned. I shall begin at the beginning and keep at two or three words until he seems sure of them." On the thirtieth, the outlook was still dark. "It seems impossible really to get ahead in reading. He doesn't exert himself; he doesn't remember words; and he confuses them. He is more trying to teach than any child I have ever taught. You accomplish next to nothing with him. If he wasn't able to tell time to the minute on a small wrist watch I would think he couldn't see well."

In May, fortunately, he made a little more progress, so that on the twenty-fourth, when he again appeared at the University he had covered twenty-five pages in the Monroe Primer though he had by no means mastered them. Before the class he read several sentences.

After he had read the first, "I can run," he looked to Dr. Witmer for the customary urging. Failing to receive it, Obadiah himself supplied the admonishment, "Go ahead," before he continued, "See me run. It is fun, fun, fun. Hop and hop, run and run. The sun is up."

To the onlookers, Dr. Witmer remarked, "This reading is the result of a very great deal of intensive work."

"Yes," volunteered Obadiah, much to the amusement of the class.

While Obadiah showed no interest in letters and words, and forgot them with discouraging facility, a number, of course, he never failed to notice, and rarely forgot. I remember him as he sat quietly on my lap one June evening, playing with a small signet ring.

"It belongs on this finger," I told him. "The others are all too big."

"Yes," he agreed sympathetically, "Nine of them are too big."

After a moment, as he slipped the ring on my little finger, he seemed to recall that, once, some three months before, he had heard my age mentioned. With intent scrutiny, he bent his smooth brown head over the finger, murmuring, "This is twenty-six years old." With deliberate interest, he examined each finger in turn with the same disquieting comment for each, "And this one is twenty-six years old."

The child's interest in numbers and his native capacity for computation impressed us as so phenomenal that for one week in June, the month of Obadiah's sixth birthday, Dr. Witmer, for the purposes of investigation, partially lifted the ban upon stimulating him to exercise his talent. During that one week, for something less than half an hour each day, I plied Obadiah with questions in arithmetic, never teaching, aiming solely to explore this singular gift to its limits. I listened with such amazement to the responses which, in so many instances, transcended our most extravagant suspicions of his ability, and I now reread the reports of the examination with such a renewal of incredulous surprise, that I shall transcribe verbatim a large part of the records.

June 9th.

Q. How many seconds are there in 140 minutes?

A. Obadiah counted rapidly by 60's, "60—120—180"—silence—"free hundred"—long concentrated silence—"eighty-two hundred seconds." The correct answer was 8400.

June 10th. Inside of fifteen minutes.

Q. How many seconds in 50 minutes? A. After silent calculation during which his fingers did not move), "Firty hundred."

Q. In 5 minutes? A. "Free hundred."

Q. In 12 minutes? A. 720.

Q. In 23 minutes? A. "Firteen hundred and eighty."

Q. In 63 minutes? A. "Firty-seven hundred and eighty."

Q. In 27 minutes? A. Sixteen hundred and twenty.

Q. How many hours in 3 days? A. 96.

Q. You are wrong.

He counted again, his fingers entirely still, his body motionless except for the curious impression he gave of some inner muscular movement within that smooth round head of his, "72."

Q. How many hours in a week?

He counted under his breath, 24—48—96, but could not proceed.

He seemed to have discovered that doubling is a practical short cut. It must require some complexity of attention and recall to add two twenty-fours to his count when he doubles 48.

Q. How many hours in 5 days?

A. 48—96—98—100—110—112—114—116—118—120.

Q. How many hours than are there in a week?

He started at 120, then calculated thus: "120, 140, and 4, 144, that's six days": then a silence, out of which came, finally, "168."

Q. If Miss M. had 100 apples and gave away 50, how many would she have left? A. (Instantly) 50.

Q. If you had 90 cents, spent 10 cents, and lost 4 cents, how much would you have left?

He calculated slowly, "90—10, that's 80—78—76—76 cents."

Q. If one apple costs 5 cents what will 5 apples cost?

He counted by fives to 25.

Q. If one apple costs 6 cents, what will 7 apples cost?

He counted by sixes to 18, by ones on his fingers to 24, then was silent with fingers still till he said finally, "Forty-two cents."

Q. There are 365 days in one year. How many in two years? (He could not do this example.)

Later in the day, inside of ten minutes, he answered the following questions:

Q. There are 3 feet in one yard. How many in 26 yards?

He counted by 3's to 18, by ones to 24, then was silent a long time, moving his fingers only part of the time. Finally he answered "78," but did not know whether it was yards, feet, or apples.

Q. If one yard of cloth costs 15 cents, how much will four yards cost?

He doubled rapidly, "15, 30, Sixty!"

Q. Sixty what? A. Sixty feet.

Q. No. A. Oh, sixty cents.

Q. If one barrel of apples cost $8, what would 6 barrels cost?

A. He doubled 8, then 16 to "firty-two," and was silent till he said, "48 cents."

Q. If 5 pencils cost 25 cents, how much will one cost?

A. 20 cents.

Q. NO, and I repeated the question. A. 26 cents.

Q. No, and again I repeated it. A. Oh, 5 cents.

Q. If 6 sticks of candy cost 12 cents, what will one stick cost?

A. "Two cents," instantly.

Q. If 8 sticks cost 24 cents, etc.

He could not answer this.

June 11th; One-half hour.

Hoping to find something he could not do, I tried Obadiah on simple fractions.

Q. What is ½ of 4? A. One.
Q. No, ½ of 4 is 2. What is ½ of 8? A. 4 (instantly).
Q. What is ½ of 10? A. 5.
Q. 20? A. 10.
Q. 100? A. 50.
Q. 200? A. 100.
Q. 24? A. 12.
Q. 30? A. 15.
Q. 60? A. 30.
Q. 48? A. 24.
Q. 72? A. "Firty-six."
Q. 94? A. 47 (about one minute).
Q. 86? A. 43 (about one minute).
Q. 108? A. 54 (about one minute).
Q. Ten hundred and two? A. 501 (about one minute.)
Q. Sixteen hundred ninety-six. A. 847 (about two minutes).
Q. No. A. 848.
Q. What is ⅓ of 6. A. 3.
Q. No, ⅓ of 6 is 2. What is ⅓ of 9? A. 4—5.
Q. No, ⅓ of 9 is 3. What is ⅓ of 12? A. 4.
Q. What is ⅓ of 21? A. 5—10.
Q. No, ⅓ of 21 is 7. What is ⅓ of 27? A. 9.
Q. What is ⅓ of 30? A. 10.
Q. 60? A. 20.
Q. 93? A. 31 (about one minute).
Q. 105? A. 42 (failed after several trials).
Q. ½ of 7? A. "Free and a half."
Q. ½of 29? A. 14½.
Q. ½ of 103? A. 51½ (about half a minute).
Q. ½ of eighty-two hundred and eleven.

A. "Forty-one hundred and five and a half," he said after three minutes of absolute silence during which his body was quiet and his face tense, as though a machine were steadily and swiftly ticking something off somewhere behind his gray eyes and broad forehead.

Q. What is ⅓ of 10? A. "4—3—3—4—4. What is it? Oh, free and a half."

Q. No, ⅓ of 10 is 3⅓. ⅓ of 16? A. 5½.
Q. No. A. 5⅓.
Q. What is ⅓ of 25? A. 8⅓.
Q. What is ⅓ of 216? A. 108.
Q. No. A. (Failed after much thought.)

Q. What is ¼ of 8? A. 4.
Q. No, ¼ of 8 is 2. What is ¼ of 20? A. 6.
Q. No. A. 5.
Q. What is ¼ of 16? A. (Failed.)
Q. ¼ of 16 is 4. ¼ of 12? A. 3.
Q. What is ¼ of 36? A. 30.
Q. No. A. (Counted audibly by fours, but couldn't get it.)
Q. What is ¼ of 24? A. 5.
Q. No. A. (Failed.)

Dr. Witmer had said to the clinic class in April that he believed he could teach Obadiah the multiplication tables in a month but that he was not going to, because he did not think it would be good for the child. I suspected that Obadiah had stolen a march on Dr. Witmer and had taught himself the tables. Therefore, in the next two days, I ran through the multiplication tables with Obadiah. At first I tried a dozen combinations chosen at random. Half of them (5×12, 3×7, 4×10, etc.) he knew instantly; the other half he answered correctly on the second trial, often getting the answer by counting. I then carried him systematically through the tables from two to eleven, taking each table by itself, but skipping from point to point within the table.

I found that he knew a very large number of the combinations, and could count the rest out quickly. He knew all the combinations in the two table instantly without error; all of them in the three table except three nines, which he got by counting by ones from 18, and three elevens, which he reached by doubling 11 to 22 and thence by ones to 33. In the four table, he counted, with only one initial error, five twos by 2, five fours by 4, five sevens, five eights, and five sixes by a mixed count, largely ones, and failed on five elevens; in the six table he counted six nines by nines and ones, six sixes, and six sevens chiefly by ones, was very slow in computing six eights, and failed on six elevens; in the seven table, he named only three instantly, but counted out all the others successfully, with but three initial errors. He gave the eight, nine, ten, and eleven tables in about five minutes for each table, counting out most of the answers, and failing to give a correct answer on the first trial in not more than two instances in each table.

June 12th.

Q. What is ½ of 911? A. 455½ (less than half a minute).
Q. ⅓ of 4? A. "One and a what? One and a fird."
Q. ⅓ of 11? A. 3½.
Q. No, 3 and ⅔, ⅓ of 12? A. 4.
Q. ⅓ of 22? A. 7⅓.

Q. ⅓ of 35? A. 11⅔.

Q. ⅓ of 595? A. (Failed.)

Q. ⅓ of 101? A. (Failed.)

Q. What is ⅓ of 75? A. (Failed.)

Q. ¼ of 8? A. 2⅔.

Q. No, it is 2. What is ¼ of 12? A. 3.

Q. ¼ of 20? A. 5.

Q. ¼ of 32? A. 15.

Q. No, it is 8. What is ¼ of 24? A. 6.

Q. ¼ of 48? A. (Failed.)

June 13th.

Q. What is ½ of seventy-seven hundred and fifty-nine?

Obadiah's face grew very tense. He became desperate and cried, "What is it? What did I say?"

Q. Seventy-seven hundred and fifty-nine.

After a long intense silence, he said, "Firty-eight hundred. Seventy-seven hundred and what?"

Q. Seventy-seven hundred and fifty-nine.

After some time he said, "Twenty-nine and a half. How many hundred? Oh, firty-five hundred, and twenty-nine and a half."

Q. What is ⅓ of 18?. A. 6.

Q. 36? A. 12.

Q. 48? A. 24.

Q. Wrong. A. 16.

Q. What is ½ of 813? A. 406½ (about half a minute).

Q. ½ of 765? A. 382½ (in one minute).

Q. ½ of ninety-four hundred and twenty-seven. A. "Forty-seven hundred and firteen and a half" (3 minutes).

June 14th.

Q. If it takes you two days to travel 700 miles, how many can you travel in one day?

A. After a minute's thought, "About free hundred and fifty."

I thought he had never heard the word *thousand*.

Q. How many hundreds are there in one thousand? A. Ten.

Q. In three thousand? A. Firty.

Q. In four thousand five hundred? A. 45.

Q. Ten times 25? A. 250 (in less than one minute).

Q. Six times 50? A. 300.

Q. Seven times 56?

A. "Two fifty-sixes,—what is that?" He counted rapidly, "112—Seven fifty-sixes." He counted inaudibly to "304." When told it was wrong, he said after a little, "292." When I again said, "No," Obadiah grew very excited, "Den I s' all tell you," he begged irresistibly, "How many is that?"

Q. What is half of eighty-six hundred and seventeen?

A. "Forty-free hundred and eight and a half" (after an interval of less than one minute).

Q. What is ½ of one thousand two hundred and fifty? A. 525.

Q. No. A. 625.

This was a little round-headed child who would not celebrate his sixth birthday for two weeks, and had never been taught an hour's arithmetic in his life. Here he sat, counting, counting, counting,—by ones, by twos, by threes, by fives, by tens, by twenty-fours, by forty-eights, by sixties, by hundreds. He did not calculate in figures; in school, they interested him no more than letters. For Obadiah, numbers were not figures, but units, and down that ever-fascinating, ever-lengthening, infinite series he could, in time, count his way to the solution of any problem.

Counting, perpetual counting, must be the salient point in this transcript of behavior. Yet I do not wish this to stand alone as the final impression of Obadiah. I cannot let the staunch, independent personality which won affection from us all be lost in the cold category of a mere mathematical phenomenon. I would rather you forgot a little the picture of the child prodigy in the gray-striped suit, sitting stiffly in the black kindergarten chair, and counting his way, with nervous concentration to the half of eighty-two hundred and eleven. I should prefer to leave with you, instead, the picture of the brown, earnest youngster of the summer on the rocky seacoast of Prince Edward's Island.

For the whole, long, dusty journey from Philadelphia, in the hottest of June weather, Obadiah was as good as gold. He tolerated even the vagaries of the Canadian railroad as the train lingered overlong in the wide farmlands of New Brunswick, content to criticize without tears, "When's the train going? It's five hours and forty minutes late. It s'ouldn't take so long to get to Halifax, Nova Scotia." Never once did he wail, till late at night he was carried across the street from the clanging station at Halifax. There on the steps of the half-darkened hotel he lifted his voice in loud lamentation.

In the invigorating air of St. Margaret's Bay, sharp with the tang of brine and seaweed, in a country that was new and different and bright with color, Obadiah gained in sturdiness and energy. It was a full mile from the house in the village, around the cove, to the schoolrooms in the long, crude, weather-gray boat-house. Each morning Obadiah, his round legs showing very brown above white socks, would run ahead down the narrow road that wound past the dull, angular, frame houses and the Fish Market Wharf with its smell of fish and wet nets, the flap of blowing canvas, and the creak of wooden vessels against the piles. On around the cove that stirred with the slow, silent life of masted schooners and small fishing craft, he raced, through the gate into the boggy pasture. At the end of the pasture he swung the turnstile with his small, sun-burnt hands, and ran out along the line of hackmatack trees to the gray schoolhouse facing the blue sea and a peninsula of gray rock and green field beyond.

There, with Miss S. as his teacher, in one of the tiny rough-finished class rooms, close to the splash of the water on the stony beach, Obadiah awoke to some interest in reading. At first he cried and giggled foolishly; always he read with extraordinary contortious but with increasing interest and accuracy. Sometimes, he would sit by himself at one of the low, smooth tables of natural wood, industriously studying his words. He always noted the number of the page, saying, "*must* is on firty-seven," till he met it again on another page, when he amended the statement, "*must* is on firty-seven and firty-nine." Sometimes of his own accord he would bring the Primer to Miss S. and gently take possession of one of her fingers to guide it along the lines as he read.

He was no longer content to pronounce meaningless words, but in his intent, eager mind, so empty of pictures, he was working to get for himself by dramatization an understanding of the lessons he read. The lesson on page 35, "My cap is in the well. It fell in. It will get wet," so interested him that he finally exclaimed with decision, "Obadiah s'all get into the well." Very soberly he put the book on the floor and set his foot upon the picture of the well. Evidently he had an idea why this was not altogether successful, for, when he failed to find himself in the well, he promptly picked up the book and with his two fingers measured the height of the boy in the picture, applying the measure to himself from the top of his head down till he reached an estimate of the comparative scale. His next stage-setting for the lesson was more realistic. He took a hat belonging to one of the boys and deliberately flung it into a ditch of water by the school-house. The wet hat was an entirely satisfactory dramatization. The climax of realism came one day when Dr. Dobb left his hat on the large round table as he passed through the living room. Obadiah looked at the hat for some time. Presently, he got up from his chair, gave the hat a vigorous punch with his fist, and then marched round and round the table in a businesslike way, giving the hat a punch each time he passed it. This extraordinary conduct seemed inexplicable until someone recalled a page in the Primer:

Can Max hit the hat? It is his hat. Hit it, Max, hit it. Hit the hat, Max.

Thus, Obadiah began to take a serious and dramatic interest in reading. Nevertheless, he did not read either easily or accurately, and always, when he returned to the beginning of the book, was found to have forgotten a large proportion of the words.

Inapt as he was, as a student of reading, Obadiah unquestionably had a precocious endowment of intellectual curiosity. Almost anything that he noticed presented a problem and tortured him till he had found some solution. When introduced to the sister of one of his teachers, he wrinkled his forehead in perplexity, "Two Miss Carrolls." In a moment, his forehead cleared, "And two grand-muvvers." The visitor's statement that there were "three Miss Carrolls" did not trouble Obadiah, for he had found his comparison: "Free Miss Carrolls and only two grandmuvvers." Once at least this intellectual curiosity was wholly disassociated from numbers. In the afternoon an alarming shriek, "A-Agnes, A-A-Agnes," brought the nurse flying to the third floor. Obadiah, when he saw her, cried out as if in agony, "Agnes, why, wh-h-y-y is tapioca yellow?"

Throughout the summer, the "lid was down," in so far as possible, upon all counting. Clocks were put out of sight and wrist watches concealed. At meal time Obadiah would fly down the porch and peer through the kitchen window at the cook's clock. He gave himself away, however, when he raced back murmuring," You don't care if it *is* 25 minutes of seven." The face of that clock, too, was covered.

Though minutes were now inaccessible, Obadiah was all the time surreptitiously counting other things. Early in the season he had had to sit a long while on a rock by the peninsula bridge because he had started to cry. When he returned to the spot five weeks later, he reminded Miss C. of the incident by saying: "Firty-seven days ago Obadiah cried here." Once on the road to school he suddenly laughed aloud and went on down the road chuckling for some time before he shared his joke with the others, "Dere are so many people in Philadelphia that you can't count them." He persisted in arranging everything in a numerical series. Even the weekly picnic gave him pleasure only because it added another island to his list. He would sit in his warm tan-colored sweater curled up against the gray gunwale of the *Lord Nelson*, happily humming "Tipperary" or "Onward, Christian Soldiers." If he chanced to hear that an island was to be revisited, the humming ceased, and a persuasive disappointed child pleaded with the teachers: "Obadiah *s'ant* go to Clay Island. You *s'all* go to the fifteenth island."

One day, William, with boy-like frankness, remarked—"Obadiah, you certainly were a mess when you came to this school." To which the accused responded characteristically, "A hundred and seventy-six days ago, Obadiah, you were a mess."

Obadiah took genuine and fearless pleasure in the water. It was a new experience. On the first picnic he walked out from the stony shore in his shoes and stockings. He seemed to realize that it was something he should not do, for he withdrew his wet feet guiltily to the shelter of some shrubs under the tall oaks. When Miss S. called him, he peered out from the bushes, muttering, "You *s'ant* go near Miss S'annon." Impressed with this idea that he must not get his clothes wet, the day that he was first buttoned into the ungainly blue jersey bathing suit which reached almost to his ankles, he refused to get wet at all until he was "ducked." When sent ashore, he snatched off the wet suit as quickly as possible, and appeared before the astonished eyes of the teachers and the skipper of the *Lord Nelson*, strolling, plump and round and naked, along the yellow crescent of the sandy shore. After that day of initiation, he loved the water, and, time and time again, he was rescued from fearlessly walking out to sea, just as nothing but his round brown head topped the water.

His enjoyment of bathing lasted until someone suggested that this would be a good opportunity to try again to teach Obadiah to dress himself. In one of the plain, unceiled classrooms, Obadiah, aglow from his bath, struggled with his white lisle union suit. He thrust his left foot into the right leg, his right foot into the left leg, then both feet into the same leg. He put it on backwards; he stuck a leg through the armhole, and an arm through the leg opening. Finally, in a frenzy of rage, he shook the suit vehemently over his head, sputtering, "How goes it den?" The next day he remembered the union suit, and said at the bath hour, "Obadiah s'all *never* go bathing again."

He did not play with the children. In fact, he felt rather superior. They all liked him, but he paid little attention to them, except in the morning before breakfast when he would try to make them laugh by standing on his head in the wicker chair, with his brown, bobbed hair tumbling about his flushed face. He never dug in the sand, never threw stones in the water. Once he picked up a long rake and raked ineffectually in the grass. This was so unusual that a note was made of it. At recess, he would often run away as far from the children as possible, a little white figure, flying up through the long grass, in and out among the young fruit trees, to the top of the green hillside, where, by the gray rail fence, he stood against the blue sky, the wind from the sea tossing his hair.

With the teachers, on the other hand, Obadiah became very sociable. After he had finished a meal with a remark such as, "Obadiah took 92 mousefuls to eat supper," or "You had 24 raisins in your tart," he would shove the other children out, and close the door confidentially. Then he would climb into a chair by the long dining-room table, saying with decision: "Obadiah s'all stay here a l-l-ong time."

In these daily visits with the teachers, Obadiah began to develop a meager line of thought which was not numerical. One day he began to reflect upon his sins. "Obadiah did five bad sings in Weston," he said, "You popped your garter. You frew Donald's cap in the water. You smeared the toose paste. You spilled your doily. You looked at the kitchen clock." When Miss S. left near the end of the summer he expressed unmistakeable regret. His face was woe-begone and his voice plaintive as he said: "It's too *bad* Miss S'annon had to go to Harrisburg. Too bad Miss S'annon stayed only fifty-seven days."

And a little later, "What will Miss S'annon do in Harrisburg?

"Teach little children."

"Den who s'all teach Obadiah?" he inquired anxiously.

"Miss B."

Obadiah thought a long time, recalling, perhaps, the unfortunate association of Miss B. with his boredom in the first difficult weeks of uncongenial work. He came to a very definite conclusion,

"No. S'e s'ant."

Though this child is a phenomenon, a juvenile mathematical prodigy; though his very talent so retards his general development as to drop him perhaps into the moron class; though, with his incoherence, his obsessions, his reactions of hysteria, he touches, possibly, even, the borders of lunacy, to close the gate of the future to Obadiah by diagnosing and treating him as an imbecile would be unfair to his capacity and to his personality. With his rational gift for computation superior to the mechanical performances of most idiot calculators, with his rare initiative, persistence, and passion in the solution of intellectual problems, with his staunch independence of thought and emotion, he should be given every chance to develop these embryonic impulses toward normal thought and action. We have no records of the childhood of men who have achieved eminence in the science of mathematics. Might not mathematical genius spring from just such a chrysalis?

EFFECTS OF SMOKING ON MENTAL AND MOTOR EFFICIENCY.

By Oscar J. Johnson,
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The following three experiments were made during the school year 1916-17 in the Department of Psychology at the University of Idaho with the purpose of finding out as accurately as could be, certain measurable effects of smoking on college students.[1] It was felt that such a study would be welcomed both by scientific men and the public at large as offering some light on a problem about which there has been much agitation and wide diversity of opinion as well as considerable legislation. There is a good deal of literature on the subject, the larger part of which is pseudo-scientific or too prejudiced to be of much value. What seemed to be needed was a scientific measurement of at least some of the effects in an experiment made either in an intensive way on a few subjects or more extensively on a larger group. As it happened, we were able to use both methods with some degree of success.

Work Done by Other Investigators.

A bibliography of the most important contributions in this field, will be found at the end of this article. Of the investigations especially worthy of notice in this connection, the ones by C. S. Berry, A. D. Bush, Edwin Leavitt Clark, George L. Meylan, and Frederick J. Pack are probably the most valuable.

Dr. Bush of the University of Vermont tested fifteen men with a series of ten mental tests and found an average decrease of 10.5 per cent in mental efficiency. The greatest decrease was in the field of mental imagery, 22 per cent, with perception and association coming next. He also found that the greatest loss in efficiency was caused by cigarettes and that they were the only ones in whose smoke nicotine was found. Pyridine seemed to be the principal toxic factor in all tobacco smoke.

C. S. Berry studied the effects of smoking on himself. Each day after lunch for twenty days he added a set of typewritten examples. On alternate days, before adding, he would smoke a cigar; on the other days he would spend this time in conversation or in reading light literature. He found that the effects of smoking were more pronounced than those of practice, decreasing the time taken to add by 7.7 per cent. The effects of the smoking were evident, because each day the time taken to add after smoking was less than the time taken the next day without smoking.

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[1] **The author wishes gratefully to acknowledge his deep debt to Dr. H. B. Reed of the University of Idaho whose advice, help, and active participation helped to make the study possible. Thanks are also due to the twenty-one men, who with willingness gave of their time and energy, some of them during a period covering several months.**

Dr. George L. Meylan of Columbia College made a careful investigation of the effects of smoking on 223 students. The results show that the average mark of the 115 smokers was 62 per cent and that of the 108 non-smokers was 69 per cent. His conclusions are these: "High School students who acquired the smoking habit before entering college are about eight months older at entrance than the non-smokers," one reason being "the depressing influences of the use of tobacco on the heart and circulation and hence the retarding effect on growth." Also, "The scholarship standing of smokers is distinctly lower than that of non-smokers. The intimate connection existing between the smoking habit and the participation in social and athletic activities, makes it impossible to determine how much, if any, direct influence the smoking habit exerts upon scholarship; but the results of this study and similar studies obtained at Clarke College indicate very clearly that the smoking habit is very closely associated with idleness and lack of ambition for scholarly achievement."

Mr. Clarke of Clarke College found that of 211 students 43.6 per cent smoked, of which only 18.3 per cent won honors as compared with 68.5 per cent of the non-smokers. The smokers exceeded the non-smokers in strength and lung capacity.

Dr. Pack of Utah, who has made a wide study of the effects of smoking based on the information received from fourteen colleges and universities, found among other things that—

	Highest Marks.	Lowest Marks.
101 Non-smokers furnish	11	6
101 Smokers furnish	5	15

And: "Smokers furnish twice as many conditions and failures as do the non-smokers." And further: "Only half as many smokers as non-smokers are successful in the 'try-outs' for football squads."

The Methods in General in this Investigation.

The three experiments are radically different as to methods and number of subjects. In the first, twenty men were used, all students of the University of Idaho, except one. Ten of these did not use tobacco in any form; six were habitual smokers; and four smoked occasionally. Three different series of tests were given at four o'clock on Friday afternoons, the tests being identical in kind and as nearly equal in difficulty as possible. Before the first series, no men smoked. Before the two other series each smoker smoked 8.5 cm. of a mild cigar. In this experiment, the relative improvement, or increase in amount of performance, and in accuracy, was used as the measure of the effect of tobacco upon both the habitual and moderate smokers. It happened that the smokers whom we chanced to pick out were superior to the non-smokers, and this may have had a decided effect on their rate of improvement.

In the second experiment we used the method of training four subjects in a smaller number of tests until their limit of improvement had been reached and then have them smoke to see the effects. Two faculty members and two students served as subjects and trained themselves in the tests from March until May. In this experiment all work was individual. When a subject had reached the maximum amount of efficiency in all the tests used, he was ready for the first smoking test. After going through the series of tests, he would smoke a cigar. Immediately after smoking, he would again take all the tests and repeat this at intervals of an hour for several hours. In some cases the tests were gone through again the next morning. To find the effects of smoking, we calculated the difference in performance before and after smoking for the several weeks during which the smoking series were repeated.

The third experiment is a survey of the school marks received by all the men of the University of Idaho during the school year of 1915–16. All the men were classified by personal inquiry into four groups: non-smokers; occasional smokers; moderate smokers; and habitual smokers. The average grades received for these four were calculated and compared.

EXPERIMENT I.

Tests Used.

1. The Genus-Species Test.
2. The Opposites Test
3. Test of "Logical" Memory or Reproduction of Ideas.
4. The Addition Test.
5. Accuracy, or Precision of Movement: Aiming.
6. Strength of Grip.

These tests were done in the usual way except that of "logical" memory. In this one, the substance of two passages of uniform and easy prose of equal length was written down as soon as read, and the average of the two passages used at each series of tests was the subject's score.

Results.

Accuracy and efficiency were the two things especially considered in working up the results. Efficiency was calculated by two methods: first by the absolute amount of work done; secondly by the formula given in Whipple's "Manual of Mental and Physical Tests," p. 313: E = eA, where "e" is the number of symbols examined and "A" is obtained from $A = \frac{c-w}{c+o}$, "c" is the number of symbols crossed, or attempted; "w" is the number of symbols wrongly crossed; and "o" is the number of symbols erroneously omitted. Owing to their nature, this method was impossible with tests three, five, and six. The second formula also gives another measure of accuracy, the results of which are given in table III.

TABLE I.—EXPERIMENT I.

Improvement of Smokers and Non-smokers.

Smokers.					
Tests.	Average Scores.			Percentile Improvement, Third Series over First	Percentile Improvement, Average of Second and Third Series over First.
	First Series.	Second Series	Third Series.		
Genus-Species........	5.0	7.1	8.3	66.0	54.0
Opposites...........	8.5	9.2	11.6	36.4	22.3
"Logical" Memory...	6.8	7.1	7.9	16.1	10.2
Addition...........	61.3	68.6	76.1	24.1	17.9
Aiming.............	5.9	5.4	5.2	11.8	10.1
Strength of Grip.....	38.6	41.7	41.8	8.2	8.0
Average percentage of improvement				27.1	20.4
Average percentage of improvement, leaving out the test of strength of grip				30.8	22.9
Non-Smokers.					
Genus-Species........	5.8	6.7	8.1	39.6	27.5
Opposites...........	7.0	9.7	10.8	54.3	45.7
"Logical" Memory...	6.3	6.9	7.2	14.2	11.1
Addition...........	53.2	64.0	69.6	30.8	25.5
Aiming.............	5.8	4.8	4.6	20.6	18.9
Strength of Grip.....	40.8	42.1	41.4	1.4	2.2
Average percentage of improvement..............................				26.8	21.8
Average percentage of improvement, leaving out the test of strength of grip..............................				31.9	25.7

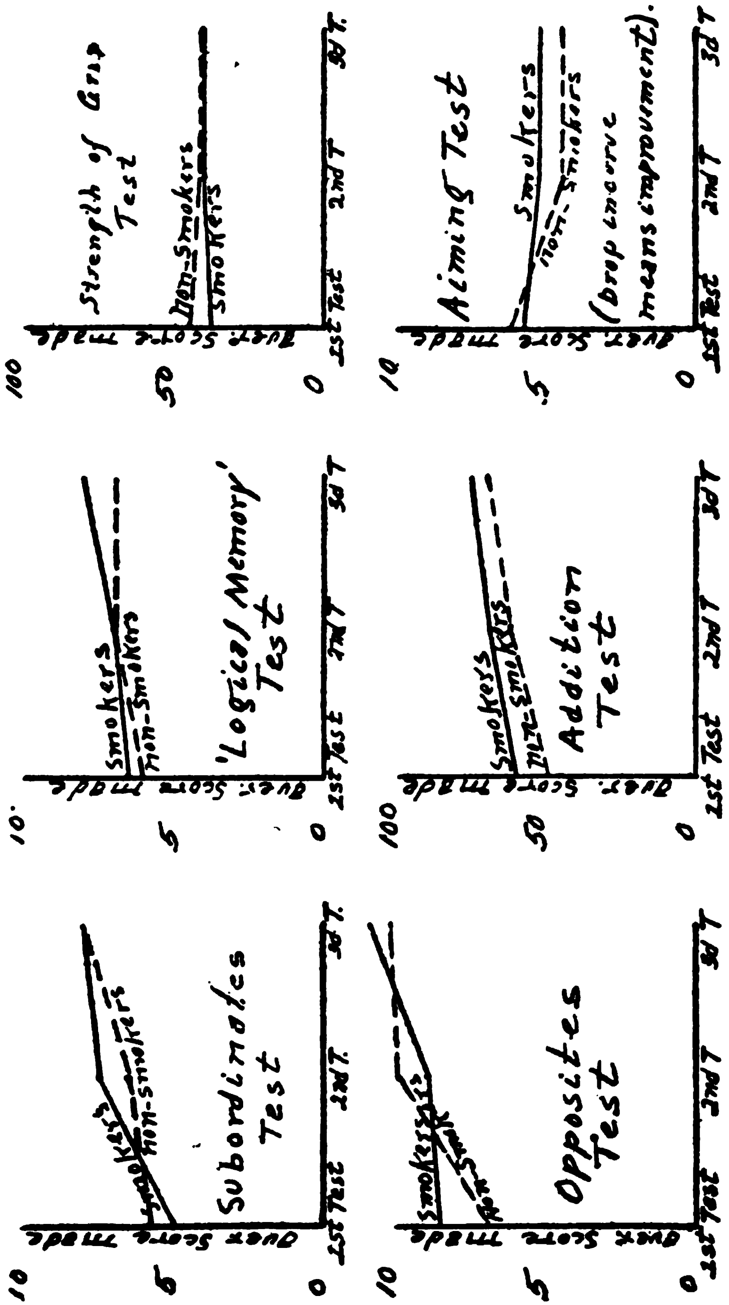
Strength of Grip Test
Non-Smokers
Smokers
100
50
0
Quest. Score made
1st Test
2nd T
3d T.
Aiming Test
Smokers
Non-Smokers
(drop in curve means improvement).
10
5
0
Quest. Score made
1st Test
2nd T
3d T
'Logical Memory' Test
Smokers
Non-Smokers
10
5
0
Quest. Score made
1st Test
2nd T
3d T
Addition Test
Smokers
Non-Smokers
100
50
0
Quest. Score made
1st Test
2nd T
3d T
Subordinates Test
Smokers
Non-Smokers
10
5
0
Quest. Score made
1st Test
2nd T.
3d T.
Opposites Test
Smokers
Non-Smokers
10
5
0
Quest. Score made
1st Test
2nd T
3d T

FIGURE I.

The improvement of the non-smokers, which was considered normal, was compared with that of all the smokers and then with the habitual and occasional smokers separately. The tables giving the results of the last two have been omitted because of lack of space. It was found, however, that the average improvement in all tests from the first to the third series for the non-smokers was 7.4 per cent less than for the habitual smokers, but 8.9 per cent more than for the occasional smokers. If we leave out the strength of grip test which was found valueless in an experiment of this kind, the above values become 6.2 per cent and 10.3 per cent respectively.

From table I and figure I it will be seen that the smokers improved more than the non-smokers in the genus-species test, the "logical" memory test, and the strength of grip test when efficiency was calculated by the amount of performance of the groups. But it will be seen that improvement in "logical" memory is only 1.9 per cent in their favor, which is so little as not to mean anything. As has already been said, the strength of grip test was generally so unsatisfactory that the only thing it does show is its uselessness. The non-smokers improved more in the opposites, addition, and aiming tests. When the average improvement from the first series to the third for all tests is taken, the result for the smokers is 27.1 per cent and for the non-smokers 26.8 per cent. If the strength of grip test be left out, the improvement for the smokers is 30.8 per cent and for the non-smokers 31.9 per cent.

By referring to table II, it will be seen that the smokers made a total of 26.5 errors in the genus-species, opposites, and addition tests (the only ones in which errors could be counted) in the first series, before smoking, as against 35.0 for the non-smokers. Incidentally, this fact again illustrates the superiority of the smokers. In the third series, these same smokers made 33.0 errors to 25.0 by the non-smokers. In other words, the smokers increased by 24.5 per cent their number of errors, while the non-smokers decreased theirs by 28.5 per cent. The per cent of all errors made to the total amount of work done during the whole experiment is 4.9 per cent for the smokers and 6.2 per cent for the non-smokers.

Table III shows that the average improvement in efficiency as measured by the formula given above is practically the same as that obtained by comparing the actual amount of work done without the use of the formula. The tests in which the smokers improved most are the same here as before.

"Logical" memory is the only test in which the smokers improved more in accuracy than the non-smokers; the respective per cents of improvement are 24.6 and 16.6. In genus-species the

TABLE II.—EXPERIMENT I.

This table shows the number of errors made in three tests in the three Series.

Tests.	First Series. No Smoking.	Second Series. Smokers Smoked.	Third Series. Smokers Smoked.	Total No. of Errors.	Percentage of Increase of Errors in Third Test over First.
SMOKERS.					
Genus-Species	0.0	0.5	1.5	2.0	....
Opposites	11.5	9.0	9.5	30.0	−17.4
Addition	15.0	38.0	22.0	75.0	46.0
Total	26.5	47.5	33.	105.0	24.5
NON-SMOKERS					
Genus-Species	0.0	1.0	1.0	2.0	....
Opposites	18.0	15.0	10.0	43.0	−44.5
Addition	17.0	11.0	14.0	42.0	−17.7
Totals	35.0	27.0	25.0	97.0	−28.5

Tests.	Total No. of Units of Work Correct.	Total No. of Errors Made.	Percentage of Errors.
SMOKERS.			
Genus-Species	204.0	2.0	0.9
Opposites	293.0	30.0	10.2
Addition	2060.0	75.0	3.6
Average percentage of errors			4.9
NON-SMOKERS.			
Genus-Species	206.0	2.0	0.9
Opposites	275.0	43.0	15.6
Addition	1868.0	42.0	2.2
Average percentage of errors			6.2

smokers improved 4.5 per cent to 13.1 per cent of the non-smokers; in opposites 6.3 per cent to 35.5 per cent; and in addition 1.0 per cent to 3.2 per cent. The average improvement from the first series to the third series is 9.1 per cent for the smokers and 17.1 per cent for the non-smokers. (See table III and figure II.)

It was felt that one reason why some of the smokers improved as rapidly as they did, besides the probable effect of their superior

TABLE III.—EXPERIMENT I.

Comparison of amount of improvement of Smokers and Non-smokers in accuracy and efficiency from the first to the third series of tests, when the two following formulas were used in the calculation.

Accuracy $= \frac{c-w}{c-o}$. Efficiency = eA.

Tests.	First Series. No Smoking.		Third Series. Smokers Smoked.		Percentage of Improvement, Third Series over First.	
Smokers.						
	A.	E.	A.	E.	A.	E.
Genus-Species........	0.87	5.0	0.91	8.2	4.5	64.0
Opposites...........	0.79	8.3	0.84	11.2	6.3	34.9
"Logical" Memory...	0.61	6.1	0.76	7.6	24.6	24.6
Addition............	0.95	60.9	0.96	75.8	1.0	24.4
Average percentage of improvement..................................					9.1	36.9
Non-Smokers.						
Genus-Species........	0.84	5.8	0.96	8.0	13.1	37.9
Opposites	0.62	6.3	0.84	9.8	35.5	57.3
"Logical" Memory...	0.60	6.0	0.70	7.0	16.6	16.6
Addition............	0.94	52.9	0.97	69.3	3.2	31.0
Average percentage of improvement..................................					17.1	35.7

intelligence, was that they exerted themselves more than did the non-smokers. The experimenter is sure that he saw evidences of this greater effort, which in some cases at least undoubtedly was unconscious. There is another factor which may have influenced the results and which is closely connected with the one just mentioned. Unlike other experiments on the effects of drugs, it was impossible to disguise the taking of it into the body. The value of such disguise was recognized by Dodge in his experiment on the effects of ethyl alcohol, and by Hollingworth in his experiment on the effects of caffeine. If this factor would materially change the subject's reactions, we are here facing a problem in technique which is very difficult to solve.

In general we may conclude from the results of experiment I that smoking reduces the accuracy and to some extent the efficiency of mental and motor activity. Furthermore, that there may be a great deal of difference in effects on different individuals and even

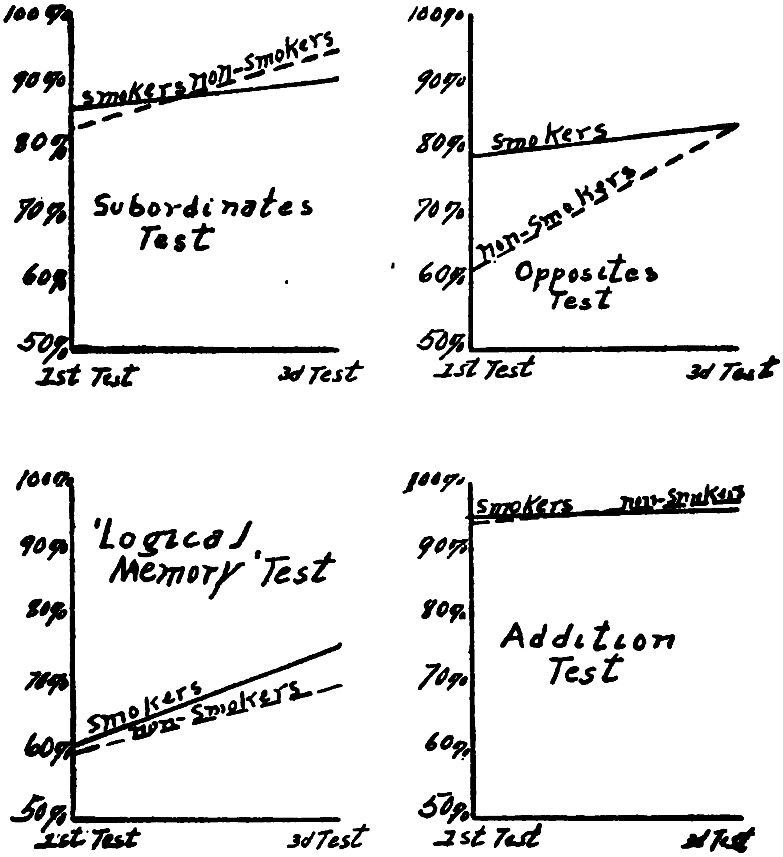

FIGURE II.

upon different functions of the same person. This is born out by experiment II in which the method of experimentation lended itself particularly to the discovery of effects on different individuals or processes and the results of which are more definite than those of experiment I.

(*To be concluded.*)

REVIEWS AND CRITICISM.

Speech Defects in School Children and How to Treat Them. By Walter Babcock Swift, A.B., S.B., M.D. Boston: Houghton, Mifflin and Company, 1918. Pp. 129.

Even if the reader did not know of Dr. Swift's excursion into the field of corrective speech work, the mere fact that this volume appears in the Riverside Educational Monograph Series, and more particularly the editor's introductory comments, would at once raise the hope that at last the teacher is to be put in possession of simple and effective methods for the correction of common speech defects. The editor experiences "a great sense of relief" in saving "the more conscientious of teachers the baffling task of trying to collect essential wisdom from scattered medical and pedagogical treatises upon this subject," presumably by offering this book for their purchase. He continues, "It is with a confident sense of service that we present an invaluable work by the eminent medical specialist with experienced insight into pedagogical ways and means. So much practical information on speech correction has never before been made accessible to teachers in such handy form." With this unqualified endorsement in mind, it is with a sense of great expectation that we approach the body of the text.

The first chapter is entitled "Importance of Good Habits of Speech," and is a brief statement of the facts well known to all school-teachers, namely, that some defects of speech in children become permanent defects, that social success depends upon correct speech habits, that bad habits of speech impede education, etc. We experience no reaction in reading this chapter except when baby-talk is defined as "simply the persistence in the *grown person* of a number of phonetic defects that the mother has implanted in her children by talking baby-talk to them." The clinical psychologist has heaped many sins of omission and commission on the head of the long-suffering mother, but until the publication of this book she has been spared this ignominy. In reviewing the clinical histories of a large number of cases with complete recovery, not a single instance is found where the mother is clearly responsible for the defect.

Chapter two is entitled "Methods for Correcting Defective Speech." The more important section of this chapter deals with the treatment of stuttering. The three steps are as follows: (1) Begin with a series of breathing exercises; (2) the holding of a note with the voice to develop the power of concentration, which is an introduction to the really important process, (3), that of holding a visual image in the mind during utterance. The importance of visualization is stressed throughout the book. The author explains: "Several normal individuals were tested with a list of some fifteen hundred questions to ascertain the conscious content of their minds during utterance. This conscious content was found to be a visual image. Then a similar series of stutterers was put through the same experiment and it was found that they constantly lacked this visual image while they were stuttering. Upon this research finding is based our treatment, which, in a word, consists in very gradually developing first meager and then larger and then very extensive visualization processes over the speech of the stutterer and so giving him that apparently essential faculty which is found constantly present over the speech of the normal individual." Thus visualization is the essential faculty which is found constantly present over the speech of the normal individual. We are at once led to inquire by what unusual processes the congenitally blind acquire articulate language. We can understand how the afflicted child may be asked to visualise "Mary," "little lamb," "spreading chestnut tree." But if he happens to stutter on "time," "glorious," "How I wonder what you are," is he to be sent to the home for incurables? It is very apparent that Dr. Swift has failed in his understanding of the origin and genesis of speech. He would otherwise have at least mentioned the kinæsthetic elements indispensible in such functions, and recognised as far back as the epoch-making discovery of Broca.

The precise procedure outlined by the author is as follows:

Position. Correct standing position.

Exercise 1. Take a deep breath slowly and exhale as slowly as possible.

Exercise 2. Same as Exercise 1, but on exhalation sound the syllable "Ma," keeping it of even volume and intensity and prolonging the utterance as much as possible.

Exercise 3. Same as Exercise 2, but instead of prolonging the "Ma" on an even pitch, sing the scale with "Ma."

Exercise 4. Same as Exercise 3, except that "Ma" is sounded on low C, high C, and low C again prolonged as before.

Exercise 5. The word "Mother" is now uttered.

Word Exercise. The patient is asked to apply the octave exercise to every word of "Mary had a little lamb," etc.

Line Exercise. Jump the octave on the first word of a line, and then let the voice run down the octave through all the succeeding words of that line until the note from which he started is reached. Use "Twinkle, twinkle, little star," etc. Then rise through the octave from the beginning to the middle of the line and then let the voice fall gradually to the end of the line. Use "When the glorious sun is set," etc. Build up in the mind of a patient clear visual images using "Under the spreading chestnut tree," etc. Continue with "The Chambered Nautilis." Wind up with the "Witch Scene" and "Dagger Scene" or the "Mad Scene" from *Macbeth*.

In the words of the author, "the modern method of treatment for stuttering has been clearly outlined above."

The remainder of the chapter is largely concerned with the insistence that both the diagnosis and treatment of speech defects is "the legitimate and exclusive function of a physician." The physician should be a highly trained man with special preparation in nervous diseases, neurology and psychiatry, and special studies of the throat. "He should also have a wide knowledge of psychology, . . . such a knowledge of individual psychology as is to be found in the schools of dramatic art." The special teacher is given a minor place in the field. The author, however, insists that a knowledge of psychology on her part is also invaluable and she is advised to study her psychology in summer courses. "But it is to be distinctly understood that the problem of speech disorders is a medical problem . . . If a physician's services are available that is enough. If not, let the teacher take the physician's place, do his work, and take his pay." Typhoid fever is a medical problem. We wonder if Dr. Swift would be consistent in his attitude and say, "Let the nurse take the doctor's pay."

Chapter three deals with minor speech disorders. Among the types discussed are "nasality," "monotony," "harshness," "hoarseness," "hasty" and "slovenly" speech. "Monotony of voice is persistent sameness of pitch and intensity." The first cause of monotony mentioned is absence of thought and emotion. On a following page, under treatment, the author states, "Monotony is easily treated," but he fails to suggest the panacea.

Chapter four is entitled "How the Teacher may Acquire a Proper Standard of Speech." She must spend some time in regular grade work; she must have enjoyed a training in elocution, music, and psychology; she must have a special training for the correction of stutterers; she must know the value of visualisation; and finally she is told where to go for training. The first place, mentioned on page 76, is the Medical School of Philadelphia. It is enough to say that no institution under that name ever existed.

Chapter five, "Speech Improvement in the Kindergarten and Elementary Grades" is a very general and pleasant discussion of the early utterances of the child, the importance of the child's speech environment, the amplification of simple speech, the application of old words to new situations, and a consideration of the early appearance of defects. Dr. Swift remarks truthfully that there is great danger in waiting for the defects to be outgrown, and insists that "no treatment could be more foolish than this."

In the final chapter, "Speech Disorders among Abnormal Children and How to Treat Them," the author points out the futility of the employment of normal phonetics and insists that marked improvement in speech will follow only upon the development of a more normal brain functioning, putting the child in possession of the normal collaborative processes, such as imagination, memory, reasoning, etc.

The teacher with ambition to do corrective speech training, but without technical preparation, who puts her faith in Dr. Swift's book, will find herself in the same position as a certain rich man who equipped himself to shine in a golf tournament by the perusal of "One Hundred Hints on Golf."

E. B. T.

NEWS AND COMMENT.

Home Letters Reduce "Shell Shock."

Frequent cheerful letters from home help to make American soldiers less subject to shell shock, according to W. Frank Persons, Director General of the Department of Civilian Relief, American Red Cross, who has been spending four weeks with the American Expeditionary Forces in France.

"Any worry about the condition of his dependents or relatives tends to put a soldier into a condition where he is subject to shell shock," says Mr. Persons. "I have this on the authority of eminent specialists who are dealing with such cases in the military hospitals. A soldier who is untouched by bullet or shell may, from shell shock, return to his trench in such nervous condition as to require hospital treatment and a long rest. The best insurance against this serious by-product of modern warfare, the physicians say, is for the man to go over the top or meet a charge in a buoyant, untroubled frame of mind in which his sole concern is the serious business at hand. Cheerful letters from home help to produce the proper mental attitude, but confidence that the home folks lack for nothing is an essential foundation.

"That our men may be protected as far as possible from worry about their families, and that nothing else that will maintain morale be left undone, it is obvious that the American people must see to it that no soldiers' families lack for anything that will enable them to write honestly cheerful letters abroad.

"To the American Red Cross has been given leadership in this vital undertaking. With utmost sympathy its 40,000 workers, organized as the Home Service Sections of 5000 Red Cross chapters, have come already into friendly touch with 300,000 families of soldiers. Whatever the need, this need has been met at once either directly by the Home Service Section, or in coöperation with local agencies."

Employment of Crippled Soldiers or Civilians.

The only sound method of dealing with the crippled soldier or civilian is to train him for a trade in which his physical disability does not incapacitate him. This is being demonstrated more clearly than ever before by the way the war cripple in foreign countries is overcoming his handicap. In fact, the complete elimination of the dependent cripple has become a real and inspiring possibility.

In this country the government will provide the necessary medical treatment, supply artificial limbs, conduct the training for an occupation, and find the job. It rests with the people, however, as to whether they will encourage the returned soldier to accept the advantages of training which will refit him for a life of usefulness and self-respect.

The American Red Cross is inaugurating a campaign to promote general intelligence regarding the true needs of the crippled soldier. The only compensation of real value for physical disability is rehabilitation for self-support. Make a man again capable of earning his own living and the chief burden of his handicap drops away. Occupation is, further, the only means for making him happy and contented.

In the readjustment of the crippled soldier to civilian life, his placement in employment is a matter of the greatest moment. In this field the employer has a very definite responsibility. But the employer's duty is not entirely obvious. It is, on the contrary, almost diametrically opposite to what one might superficially infer it to be. The duty is not to "take care of" from patriotic motives, a given number of disabled men, finding for them any odd jobs which are available, and putting the ex-soldiers in them without much regard to whether they can earn the wages paid or not. Such a procedure cannot have other than pernicious results. Experience has shown that men placed on this basis alone find themselves out of a job after the war has been over several years, or in fact, after it has been in progress for a considerable period of time.

A second weakness in this method is that a man who is patronized by giving him a charity job, comes to expect as a right such semi-gratuitous support. Such a situation breaks down rather than builds up character, and makes the man progressively a weaker rather than a stronger member of the community.

The third difficulty is that such a system does not take into account the man's future. Casual placement means employment either in a make-shift job as watchman or elevator operator such as we should certainly not offer our disabled men except as a last resort—or in a job beyond the man, one in which, on the cold-blooded considerations of product and wages, he cannot hold his own. Jobs of the first type have for the worker a future of monotony and discouragement. Jobs of the second type are frequently disastrous, for in them a man, instead of becoming steadily more competent and building up confidence in himself, stands still as regards improvement and loses confidence every day.

The positive aspect of the employer's duty is to find for the disabled man a constructive job which he can hold on the basis of competency alone. In such a job he can be self-respecting, be happy, and look forward to a future. This is the definite patriotic duty. It is not so easy of execution as telling a superintendent to take care of four men, but there is infinitely more satisfaction to the employer in the results, and infinitely greater advantage to the employee. And it is entirely practical, even in dealing with seriously disabled men.

The industrial cripple should be considered as well as the military cripple, for in these days of national demand for the greatest possible output there should not be left idle any men who can be made into productive workers.

VOL. XII, NOS. 5-9 MAY 15, 1919

THE
Psychological Clinic

For the normal development
of every child

PSYCHOLOGY HYGIENE EDUCATION

Editor: LIGHTNER WITMER, Ph. D., University of Pennsylvania

REFERENCE BOOK
in Clinical Psychology
and for Diagnostic Teaching

THE PSYCHOLOGICAL CLINIC PRESS
Woodland Ave. and 36th St.
Philadelphia, Pa.

THE PSYCHOLOGICAL CLINIC

A Journal of Orthogenics

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Subscription price $2.50 per annum (nine numbers). Single numbers, 40 cents.
Vol. XII, Nos. 5-9, $2.00, Volumes I to XII, $2 50 per volume.
All other special price lists are cancelled.

Published monthly except July, August and September, by Lightner Witmer, College Hall, Woodland Avenue and Thirty-sixth Street, Philadelphia, Pa.

Entered as second-class matter February 12, 1908, at the post office at Philadelphia, Pa., under the Act of Congress of March 3, 1879.

Send subscriptions and all communications to

THE PSYCHOLOGICAL CLINIC PRESS

Woodland Ave. and 36th Street, Philadelphia, Pa.

The Psychological Clinic

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Vol. XII, Nos. 5–9 May 15, 1919

PERFORMANCE AND SUCCESS

An Outline of Psychology for Diagnostic Testing and Teaching.

By Lightner Witmer, Ph.D.,
University of Pennsylvania.

This outline of a new psychology is published primarily for the use of students of psychology at the University of Pennsylvania. It covers a part of what is taught students both at the Summer School Session and in the College and Graduate Departments. The student who has understood and assimilated it, is ready to apply his acquired knowledge to the interpretation of the results of a psychological test, and to employ psychological diagnosis in the practice of teaching.

The psychology here outlined is a clinical psychology, that is to say it is the psychology of an individual child or adult. This outline is the skeleton of a body of knowledge which must be held in mind in order that behavior may be accurately described, justly valued, and so conformed to the standards of society that the individual may make his life a success. To be successful, every performance or undertaking must be motivated and controlled by intelligence, directed by intellect, and adequately conformed to the prevailing social standards. The value which I claim for this psychological outline is that it works in practice, whether for individual or social diagnosis, whether for teaching or vocational guidance, whether to ameliorate or offset a defect.

OBSERVATION

Psychology, like every other science, is based upon observation. The psychologist observes performers and their performances, infers their purpose or intention, and then records the results of a performance in terms of success, the zero point of which is failure.

Psychology, therefore, observes the performances of individual men and women, children and animals, for the purpose of determining their relative competency to achieve results of standard value.

Observation is a scientific method. It is also a congenital ability which every normal child displays from early infancy. By means of observation the child acquires knowledge which he then employs to guide and control his future performance. At the developmental level of the college student and at the various intellectual levels of everyday life, observation operates as an important capability. Success or failure rewards the individual's congenital and acquired ability to observe.

To observe is to attend to something and to make note of it for a purpose.

If an individual discerns the purpose of his observation, his purpose is called an intention. He may make an observation without intending it. For example: he may spit out of his mouth an article of food which he has observed to have a bad odor. He may be saving his life by this act of instantaneous rejection. At the moment of performance, however, he may have discerned neither the purpose of his act nor of his observation. Every normal individual is equipped with an ability to observe without intention and to act without reflection, just as he is equipped with a congenital ability to breathe, to swallow, to walk, to talk, to hear sounds, and to see shades and colors of objects. The purpose of a performer's observation may be revealed to him only after he has made it. For much casual observation, we may be unable to give a reason and it may, indeed, have little or no intention, but it is nevertheless motivated by congenital ability having purpose, which, when particularized, is called the instinct of curiosity, the source of all observation and of every science.

DESCRIPTION

A scientific observation is not completed unless the observer notes what he has observed. The flitting attention of the child or adult doubtless determines behavior and increases efficiency, but it will not add much to the performer's knowledge. It is necessary for him to note what he observes, even though it be only a mental note. This mental note is the result of the operation of another ability, *i. e.*, memory. To fix in memory what has been observed usually requires some expression in the form of an oral or written record. The student of psychology cannot learn much from his observations unless he has been trained to keep written records of what he observes, or, in other words, to give precise descriptions. From the written records he can then select what has significance or value in relation to his intention at the time he made the observation. A summary of his recorded observation, he must then embody in a report which may lead to and comprise explanations, diagnoses, conclusions and general principles.

Observation, then, is not a simple but a complex ability. The two abilities which compose it are attention and memory.

ATTENTION

To attend to something is to particularize one thing out of an aggregate of things. The child comes into a room full of people, gasps as he observes the strange faces, and flies to his mother's lap. His performance shows that he has particularized his mother out of all the objects of his environment. We observe some one with a toothache. He holds his hand to his cheek, groans from time to time and cannot attend to his work. He is particularizing out of all the things that he might particularize, one thing only, *i. e.*, pain.

INDIVIDUALIZATION AND UNITIZATION

The observer pays attention to performers: a child, an adult, an animal; or he observes performances: something done by a performer, either a single or discrete performance or a continuous series of performances occupying minutes or even hours. He also observes occurrences: the setting of the sun, or the passing of a train. He observes objects: the stars, the trees, a house. Among the objects which a psychologist observes are the performer's hands and feet, his head and body.

Attention unitizes many occurrences into a single event, as when we speak of the Civil War, many objects into a single object, as a pile of bricks. It unitizes all the objects of the world, and calls this single thing a universe. To particularize a performer is called individualization.

Attention is particularization. The degree of particularization is measured on the scale of definiteness.

Attention to a severe pain, to a band of music, to a bright object is very definite in particularization. When one is half overcome with sleep or stands looking into the dusk at some fading landscape, particularization is indefinite: no one object in particular holds attention. The performances of children and adults differ greatly in definiteness of particularization. It is more important, however, to ascertain what a performer is particularizing at the moment and to discover what he particularizes habitually, than it is to measure the definiteness of his particularization.

Psychology, therefore, observes individuals and even groups of individuals, which may be either unitized or individualized and called the family, the army, the nation or the race.

Psychology observes relatively simple performances like walking, and complex performances like the cross-examination of a witness which is the unitized particularization of many component performances.

Performances may be unitized, even though not in a continuous series, as when we speak of a boy's behavior at home or at school, or an individual's behavior through life, or the behavior of an army or nation during the war.

Psychology is, then, correctly defined as a science of behavior.

GROWTH AND CULTURE

To understand the performances of an individual it is necessary to know something of the performer's ancestral and individual development and relate this to the evolution of the race from lower forms and of the adult from the newborn babe. What comes first in the history of the race or individual—for example, desire, hope and fear—may be operative in every performance under observation and essential to the interpretation of behavior. The life of an individual may be plotted as a line of development beginning at birth and ending with death. As we pass from the initial to the terminal points on this line of ontogeny, we pass over a series of increasingly complex performances, until we reach the point where development ceases and the degeneration of senility sets in. It is necessary to distinguish two lines or scales of individual development: *the growth scale*, on which we plot his development in body and mind, and *the culture scale*, representing his growth in knowledge through education and experience.

The line of organic development from the lowest forms of living organisms to the highest type of human being is the line of phylogeny. This line also is divided into two lines: the scale of organic evolution, or more simply *the species scale*, and the scale of racial culture, *the civilization scale.*

Every performer under observation can be assigned with more or less certainty to a position on: first, the species scale; second, the civilization scale; third, the age scale; and fourth, the culture scale.

These scales are used for the purpose of estimating relative position, or rank, when one performer is compared with another. On any one of these scales a lower position than the average for chronological age is called retardation. On the species scale retardation is atavism; on the civilization scale, primitivism; on the growth scale, infantilism; and on the culture scale, ignorantism.

TELEOLOGY AND ETIOLOGY

Continuous observation shows that every particularized performance is preceded and followed by other performances, by occurrences, and by the appearance and disappearance of objects, as when a child builds his blocks into what he calls a house, and then knocks them down again, or children on the street dance to the music of an organ-grinder and resume their play when he departs.

Among the performances, occurrences and objects which are observed to precede a particular performance, one stands out, either because it is always to be found among the antecedents of the performance, or because the performance does not take place unless this antecedent appears. This constant or necessary antecedent to a performance is called the cause, and the performance is then regarded as an effect. Etiology is the science of cause and effect.

Every performance is followed by consequences, one of which acquires unusual significance because of its greater constancy and apparent inevitability. This is called the purpose of the performance, and the performance is then considered to be the result or end of this purpose. Teleology is the science of purpose and end.

It is impossible to understand the performance of a human being, or for that matter of any other organism, without interpreting these performances in terms of purpose as well as explaining them in terms of cause. We do this whenever we attribute to a performer, whether a human being or other organism, an ability to produce the performance under observation. Why does a child shut his eyes when I flash a bright light before them? Because he is able to make a movement having the purpose of excluding the bright light, and because the light makes him shut his eyes.

Every performance is at one and the same time the result of an attributed ability and the effect of a cause or stimulus. Every ability attributed to the performer in order to explain his behavior, is both a cause, in the sense of a purpose to initiate the performance, and also a cause in the sense of a stimulus to effect a reaction.

An ability which we attribute to a performer in order to explain his behavior may be either congenital or acquired, but is usually both. I use the word "capability" to indicate that the ability in question is mainly or wholly congenital; thus curiosity is a capability, but observation is partly congenital and partly acquired, whereas scientific observation is wholly acquired, although developed from congenital abilities.

Every acquired ability, in so far as it is acquired and not congenital, is the effect of causes acting during the individual's lifetime. Whether the existence of a congenital ability can be explained as the effect of causes acting through heredity and derived from the environment, I leave to philosophers and biologists. The starting point of psychology is the assumption of a number of congenital abilities, and the first question to be answered is how many and what congenital abilities are to be recognized as potentially existing in every normal individual.

EXCITABILITY

Spontaneity	*Irritability*
Initiative	*Guidance*
Performance	*Reaction*
Expressibility	*Susceptibility*
Competency	*Efficiency*
The Start	*The Guide*
Control	*Direction*
Motivation	*Stimulation*

Excitability is the ability of a performer to be excited by a stimulus to initiate a performance. It is displayed by living organisms at the lowest point of the species scale and the highest, from the point of birth on the age scale to its terminal of death. Excitability initiates a performance and reacts to a stimulus. It is the teleological cause of a performance, and at the same time, the initiated excitement is the effect of a stimulus. It is necessary, therefore, to distinguish the initiative of excitability, sometimes called spontaneity, but for psychology better known as expressibility, from the ability to react to a stimulus, which is called irritability by the biologist, and susceptibility by the psychologist. The primitive and unparticularized performance initiated by excitability is an excitement, a part of which excitement is an emotion. Emotional excitement is therefore the primal display of the excitability of a performer as well as his unparticularized reaction to a stimulus.

The primal urge of the organism is the urge for air, food, water and sex. In the course of ancestral evolution and individual development, the more primitive and unparticularized urge, becomes the particular urge to fight; the urge to migrate, of which truancy is a variety; the urge to court, to marry, to beget and raise children. The highly particularized urge to organize an educational system for the benefit of all the children of a community is only a particular display of the aboriginal urge for the preservation of the individual and the race.

The motivation includes all the purposive antecedents of performance, whether the purpose is discerned by the performer or not. It includes all his congenital and acquired abilities, among which some may be particularized as emotions or ideas, others, as instincts or habits.

When the purpose of an ability, operating to produce a performance, is discerned by the performer, or its existence is assumed by an observer, the discerned or assumed purpose is called a *motive*. Included among the motives are the emotions and many instincts. When the performer not only discerns his purpose but also particularizes the consequence or result of his performance, we call the purpose of his performance, an *intention*. When his judgment, accepting the motive or intention, approves the purpose and means employed to secure the end or result of the performance, the performer gives a *reason* for his performance. When the performer's motives, intentions and reasons are compared with a prevailing standard of conformed behavior, the observer diagnoses the performer's judgment as being either good or bad, successful or unsuccessful. Teleology therefore presents the motivation of human behavior. It offers a classified list of the congenital and acquired abilities which constitute the performer's initiative. Etiology is a study of the stimuli causing him to react to the changing conditions of his own body or to the objects and occurrences of his environment. Motivation and the initiative are endogenous, stimulation and the reaction are exogenous.

The human body occupies a peculiar position. Within it originates the motivation of behavior, and within it, as well as beyond it, are the stimuli of reactions. The etiology of stimulation includes stimuli arising within the performer's body, excluding only what belongs to the teleology of motivation.

THE EMOTION

Emotives		*Directives*	
Mood		Desire	
Exhilaration	Dejection	Inclination	Disinclination
Elevation	Depression	Want	Aversion
Interest	Ennui	Like	Dislike
Wish	Dread	Love	Hate
Hope	Fear	Mania	Phobia
Glee	Gloom	Inertia	
Mania	Melancholy		
Lethargy			

Passion		Feeling	
Sympathy	Antipathy	Pleasure	Displeasure
Tolerance	Intolerance	Appetite	Distaste
To make	To break	To seek	To shun
To build up	To tear down	To welcome	To eject
To promote	To oppose	To acquire	To reject
Apathy		To accept	To refuse
		Torpor	

The primal motive of the organism is desire, discriminated as an inclination or disinclination. Nearly every performance displays a want or an aversion as its motive. Desire is a display of energy; its varying intensity measures the amount of energy at the disposal of the individual. The indifference point of desire is inertia, a diagnostic symptom of exhaustion, malnutrition or satiety. On the intensity scale of desire, we may pass from an inclination or disinclination to stronger likes or dislikes, and ultimately to the maxima of love or hate, the pathological manias and phobias.

Desire is the performer's motive. Its expression is a performance resulting in success or failure, satisfaction or dissatisfaction. Mood is the expression of an urge to performance, either wishing or dreading, either hope or fear, and at the same time, it is a reaction to the initiating energy of the organism. On the one hand, there is the exhilaration of wishing or succeeding; on the other, the depression of dreading or failing. Lethargy is the indifference point.

Interest and ennui, hope and fear, are increasingly more intense displays of the alternating moods of exhilaration and depression. Pathological exhilaration is displayed in the maniacal stage of manic-depressive insanity, while melancholia is the final stage of depression.

The fear psychosis is at the basis of many defects in children, just as it is the source of much mental disorder in adults. In both children and adults it is a display of depression.

The etiology of exhilaration and depression must concern itself with the normal surge of energy, now to exhilaration, now to depression, as well as with the pathological and more or less permanent stages of manic-depressive insanity. The mood line of every normal individual rises and falls now above and again below the zero line of indifference separating exhilaration from depression.

Desire and mood are both dependent upon the kinetic energy at the disposal of the organism and employed in the performance. The rhythm of desire is a short pulse, that of mood, a longer surge of energy. The metabolism of the so-called kinetic glands is the etiological factor determining the display and rhythm of desire and mood. Likes and dislikes, hopes and fears, are the primal and unparticularized expression of metabolism. They are fundamental motives of behavior, early discriminated by man as the four emotions —I call them emotives—love, hate, hope and fear.

Desire and mood are expressed in the emotionalized attitudes of sympathy and antipathy. These, in turn, motivate the performer to do something, "to promote" or "to oppose," and in the performance, he will display respectively the emotionalized attitude of tolerance or intolerance. Directed more particularly to objects, expressibility leads him "to build up" or "to tear down,"—toward individuals, "to yield" or "to fight," displaying respectively friendliness and hostility. From this stage of development, particularization rapidly becomes more definite. Sympathy or antipathy is an emotionalized urge to unparticularized performances. Like desire and mood, they are emotives. The particularized operation, however, is commonly called an instinct, by which is meant the congenital ability of the performer to carry on an operation of definite particularization. The indifference point of passion is apathy, a condidition in which motives are incapable of giving rise to expressive operations. Doubtless, like other emotives, apathy is dependent upon the energy conditions of the organism. The instinctive urge to performance may produce an operation without a motive, and at times even in apparent opposition to a motive. The performer is then said to act upon instinct or impulse. Operations which are never (or seldom) controlled by the performer's motives are generally classified as reflexes. The initiative of the performance includes, not only the motivation of performance by motives and intentions, but also operations produced without emotional motivation. Expressibility, therefore, is the ability to do, to carry on, to operate, no matter what the source of motivation may be.

A particular form of expressibility is the urge to seek pleasure and to avoid displeasure. Pleasure and displeasure are emotives. Appetite and distaste are particularized expressions of desire, as sympathy and antipathy are expressions of love and hope on the one hand, of fear and hate on the other. Towards individuals or towards objects, susceptibility leads the performer to seek and to welcome, or contrariwise, to shun and to eject. Acquisitiveness and rejection are the contrasting attitudes and operations of susceptibility; appetite and nausea the concrete prototype. Torpor is displayed at the zero point of indifference. Torpor, like apathy and the other zero points of motives, is dependent upon the energy of the performer.

I have now differentated eight emotives: inclination and disinclination, hope and fear, sympathy and antipathy, pleasure and displeasure. Under one or the other of these, or under some combination of two or more, the motives to behavior may be classified. Inertia, lethargy, apathy and torpor are displayed at the physiological zero point of metabolism. The etiology of these emotives, referred to anabolic and katabolic processes, constitutes an interesting and important study of the physical conditions of the body upon which health and disease as well as performance ultimately rest.

The emotives, as such, display the performer's initiative, which expresses itself now in one operation and again in another. The particularization of any one operation rather than another displays the performer's ability to guide or direct as well as to initiate a performance. The first directives to be discerned by primitive man and the child would appear to be appetite and distaste, pleasure and displeasure. As discernability increases, desire and aversion are observed, both by the performer himself and also by other observers, to be a part of the performer's guidance. Any directive, however, may be a part of the performer's motivation and play the rôle of an emotive, and any emotive may be employed to guide the expression of the performer's excitability. Mood and passion are commonly displayed as emotives, desire and feeling as directives. In the interpretation of any particular performance, the performer and those who observe his performances will often differ in opinion as to whether a displayed emotion is to be explained teleogically as an emotive or etiologically as a directive. As a matter of fact, this is precisely the line of distinction which differentiates what is called a motive from an intention.

DISCERNABILITY

Discernability is the ability of a performer, when excited by a stimulus, to observe not only the stimulus but also his own performance. The performer does not observe all of his own performance; for example, the contraction of the pupils of his eyes under the stimulus of pain. On the other hand, the performer observes what another observer does not discern: the emotion.

Performances, discernable only by the performer, are called conscious performances. The performer observes his own mental operations. The unitized aggregate of a performer's mental operations is his consciousness. The observation by the performer of his own mental operations is called self-observation or introspection.

Psychological tests stimulate the performer to initiate performances, in which mental abilities may be displayed. The psychological examination is concerned with those performances in the interpretation of which it is necessary to assume the existence of consciousness, and to attribute to the performer mental abilities. The performer's mind is the individualized aggregate of all his mental abilities, operating with varying degrees of particularization. The so-called "intelligence tests" are strictly speaking only performance tests. When performances are interpreted with the aid of the psychological assumption, performance tests become mentality tests, tests of the performer's mental abilities.

Every performance is a resultant of the operation of one or more mental abilities. The more definitely the performance is particularized, the more clearly do we recognize it to be a discrete operation. A fit of rage, adding up a column of figures, answering a letter—these are operations. In the course of racial and individual evolution, unparticularized excitement, whether emotionalized or not, developed into more definitely particularized operations. In the life of the individual, this is partly the result of knowledge acquired either by experience or by training, and partly the unfolding of congenital capabilities. The operations of discernability, are measured on the scale of vividness and on the scale of definiteness. On the scale of definiteness, the operation of discernability is what is commonly called attention.

THE OPERATION

The Start		*The Guide*	
Kinesis: Motibility		*Aesthesia:* Discernability	
To do—to struggle		To feel—to taste	
To promote	*To oppose*	*To get*	*To eject*
Pliability	Obstinacy	Pleasure	Displeasure
Imitation	Negativism	Enjoyment	Suffering
Creation	Destruction	Acceptance	Refusal
Organization	Disorganization	Belief	Disbelief
Law	Anarchy	Acquisition	Rejection

The urge to do, or, to struggle, and the urge to smell, to taste, to feel with the hands, to listen, to look at, to move about, acquiring pleasures and rejecting displeasures, these motivate the performer to employ his muscles in coordinated movements. The movements are the operation. The instinctive operations of "doing," I call kinesis. The instinctive operations of "feeling," I call aesthesia. In proportion to the energy at the performer's disposal, he employs force in the operations necessary to accomplish his purpose. To overcome resistance, man uses force. He discerns at once his own force and his need of more force. He, therefore, seeks to augment his own force, and to win the supporting forces of nature and of the supernatural. The acquisition of force and ever more force has led man to discover knowledge and to organize and employ it as an instrument to overcome the resisting forces of nature. The child's instincts are his first instruments of expression. His organic heredity endows him with instruments of locomotion, with the right hand for operations requiring skill, with organs of articulation, which are the instrument of speech, and with those highly developed instruments of precision, the eyes, which work together as a single binocular organ of vision enabling him to explore objects even though at a distance. "Knowledge is power!" Upon this maxim, European civilization has been nourished. Fire, the chemical balance, writing, the printing press, the mariner's compass, gunpowder, the telescope and the microscope, all these instruments have been added to man's congenital forces.

The urge of appetite and distaste (nausea) leads man to smell, to taste, to put food into his mouth or reject it, to masticate, to savor and then to swallow it. If distaste does not reject it, an organic nausea may, and the congenital reflexes can even eject it from the stomach after he has swallowed it. Along this road, man began to particularize his pleasures and displeasures, and these in turn became motives to wider exploration. He discovered, also, the pleasure of accomplishment, but strenuous activity always remained a joy in itself, for activity is an exhilarant and awakens desire without the intermediation of pleasure. Men do and dare; living they struggle, and struggling die, often without asking why, neither expecting rewards in terms of pleasure, nor fearing penalties in terms of displeasure. Kinesis is motibility; the ability "to do," to carry on—even without the motive of desire or enjoyment. It motivates the strenuous life in which the pursuit of power becomes an ideal of desire, in comparison with which the pursuit of enjoyment offers but feeble interest.

If kinesis has led man to exert his own force and to discover the forces of nature, aesthesia has led him to discriminate and appreciate his sense-perceptions. Seeking enjoyment, accepting the agreeables and rejecting the disagreeables, he learned to know good and evil. If kinesis has initiated the pursuit of knowledge, aesthesia has directed it.

POWER: MENTABILITY

Initiative	*Guidance*
Competency	Efficiency
Eccentricity	Conformity
Control	Direction

Control is the ability to employ the necessary organic and other instruments so as to accomplish the purpose of the operation, or briefly, "to make a success of it."

When did your child begin to walk? When did he begin to talk? These questions are always asked at the Psychological Clinic. The answer will disclose whether the child has been slow to display control of his capability to walk and to talk. How well does he walk and talk now? The answer to this question establishes his present proficiency in walking and talking. The ability to walk at all is one of the capabilities comprising what I call the child's congenital competency. Reading and writing are acquired abilities. As soon as he is just able to read and write, he establishes his competency to read and write. He has then acquired control over many different capabilities, and learned to coordinate them to the desired end. In time, his efficiency in reading and writing, which at the first successful attempt is approximately zero, will increase until he gains control over these two operations and begins to employ them as instruments to acquire knowledge and express his thoughts. A child's competency to read and write may be easily ascertained by the attempt to teach him reading and writing. During the first school year, he should have established his competency and acquired a measurable efficiency in these two operations. As he passes from grade to grade he will increase in efficiency, attaining at successive levels of performance the proficiency standards prescribed for each grade. Proficiency is a composite result of the measured efficiency of an operation and of the performer's estimated competency.

To determine the efficiency of an operation, we measure the amount of product obtainable in a given unit of time. Arithmetic for example, is made up of four elementary operations: addition, subtraction, multiplication and division. Efficiency in the operation of addition is determined by the number of accurate additions which the child is able to produce in a given unit of time. Accuracy measures the competency. Efficiency is measured in terms of time and product.

Practice and training may increase efficiency indefinitely. The excessive efficiency of an operation is no more to be desired than inadequate efficiency. The standard of efficiency to be established for a particular operation will depend upon the use to which the operation is put. A child need not learn to write with a copper-plate efficiency. The standards of efficiency in writing are concerned with legibility, speed and ease of production. When the performer has acquired the standard efficiency in any operation, it becomes a new ability, an acquired competency, an instrument under his control and ready for use. The child should acquire reading and writing as *instruments* before he has completed the sixth school year, although by the time he has finished the first school year, we may ascertain whether he has the competency to read and write. If a foreign language is to be learned, the aim should be to develop an adequate instrument which can be used to exchange ideas with the foreigner and to procure information or enjoyment not otherwise obtainable.

The history of organic evolution, as well as the ontogeny of a child is the story of the organization and control of a number of diverse abilities so as to perfect a new unitized ability, which is then controlled as a single instrument. The right hand is a congenital instrument. Speech is another. The discovery of fire meant the organization and control of many abilities, with the result that an important tool of civilization was invented. Printing, gunpowder, and the discoveries of science and art, provided the human being with instruments of precision, enjoyment and general utility. Of congenital instruments, the eye is perhaps the most important. In comparison with other organic instruments, binocular vision, articulate language and the right hand are instruments of precision, comparable to the chemical balance, the telescope and the microscope among mechanical and scientific instruments.

Conformity is displayed in the relative constancy or accuracy of an operation. Absolute conformity or accuracy is the only acceptable standard in arithmetic. The performer, when required to add two and three, either succeeds at the task assigned him, or fails. If he fails to give the sum, he displays a lack of competency. In operations other than those of arithmetic, an absolute standard of conformity is not commonly obtained. Walking is an operation displayed by every normal child or adult, but the gait of individuals will display much variety, in grace, rhythm and precision of movement. In walking, the individual may display considerable eccentricity, and yet come within the accepted standard of conformity. Organic eccentricity is called variability. Some measure of conformity to type is required of every operation. No individual, however, conforms to type in all his operations. He displays more or less eccentricity. The line between normal variability and abnormal deficiency or defect is a proficiency criterion, determined partly by the biologist, but in mental operations chiefly by individual or social requirements.

INTELLIGENCE

The Competency Grades The Intellectual Levels

Intelligence is eccentricity. Its only criterion is success. Intelligence is the ability of the individual to solve what for him is a new problem. It is the ability of the organism to change a conformed competency to meet new conditions. Intelligence is a capability which does not necessarily increase with the intellectual and other resources at the performer's command. It may atrophy through disuse, however, and often does, especially under a rigid system of educational training.

Intelligence, then, is successful eccentricity. It is competency achieving success without efficiency. It is the performer's initiative operating successfully but without sufficient guidance to make success more probable than failure. Any test is an intelligence test if the performer has not been so well instructed or is not given such directions that success is sure. The formboard is an intelligence test for a three- or four-year-old child, provided he is merely directed to replace the blocks. If he is shown how to replace the blocks or if, as he proceeds, he is told when he is right or wrong, the formboard no longer serves as a test of intelligence. Intelligence is displayed only where the probability of success is fifty per cent or less, and intelligence increases as the probability of success diminishes. If a test is above the intellectual or knowledge level of the performer—for example, the formboard at the two-year level, the cylinder test at the four-year level or a problem in arithmetic at the six-year level—the probability of success is zero, and it can not be used as an intelligence test. A performer's failure with an intelligence test indicates that his invention is deficient or that the test is above his intellectual level.

For a more extensive consideration of intelligence see my article on "The Relation of Intelligence to Efficiency" in the Psychological Clinic, May, 1915.

JUDGMENT

Qualitative		Quantitative	
Normality	Abnormality	Success	Failure

The primal judgment is probably an expression of antipathy for the unusual. Abnormality attracts attention and arouses dislike. The qualitative judgment of conformity is approval; of eccentricity, disapproval; and the naive distinction between normality and abnormality is based upon the emotionalized excitement initiated by an inclination for what is familiar or a disinclination for what is strange.

Success and failure give rise to the primal quantitative judgment. It is based upon an observation of the operation and its results. The judgment may express approval even of eccentricity provided it has brought success. Judgments may be either reflective or emotive. Judgment, however, is displayed even in behavior which is not intentional or reasonable. The behavior of an individual is the resultant expression of all his motivation—the organic urge to performance, as well as the discerned motives. A startling conflict is often to be observed between the individual's initiative and the social standards of conformity.

ATTENTION

Alertness	Persistence
Speed	Endurance

The time which the performer requires to initiate a movement in response to a stimulus is called his reaction time. It measures the alertness of attention. It depends upon the speed at which the energy of senso-motor reaction is discharged. Speed is a congenital characteristic. The "rate of movement," *i. e.*, the speed of an operation is probably dependent upon the same conditions of metabolism as the speed of "energy-discharge." It is also an individual characteristic, as displayed, for example, in the speed of walking, running, talking and thinking.

The motivation of organic energy causes the organism to display now this, now that, capability; now this, now that, operation; the performer is always on the move, his attention is always flitting from one particularized performance to another. Persistence of attention is the ability to keep on particularizing one and the same reaction to a given stimulus, despite distractibility due to the motivation of other capabilities and despite the distraction of other stimuli. The ability to give persistent attention distinguishes man from the apes, the intellectual man from one who is less highly organized.

Alertness is the liveliness of attention. It is measured by the time the performer requires to initiate a movement in response to a stimulus. Attention is alert when the performer's excitability is quick to cause him to discern and to react to each and every stimulus that may be presented. As the alertness of attention becomes particularized, it develops into expectant attention, alert to one class of stimuli but inert to others. Competent attention is the successful compromise between unparticularized alertness and particularized expectancy.

Attention may or may not be motivated by interest. A child can be compelled to pay attention to what does not interest him, but interest is an exhilarant, and although we can be compelled to give attention to what depresses us even to the point of ennui, the effect upon the organism, if prolonged, is to make heavy drafts upon the store of energy.

Endurance is the ability to carry on the same operation despite the distraction of fatigue, or to carry on some operation, no matter what, despite exhaustion. In the ability to resist fatigue and exhaustion, the performer displays the amount of energy at his disposal.

Rapid fatigue or exhaustion and a slow speed of reaction and operation indicate relatively little energy. A slow rate of reaction and operation may, however, be a congenital attribute and have no apparent relation to endurance, excepting that slow reactors and slow operators cannot be speeded up to keep pace with quick discharging and moving organisms, without causing loss of control and rapid fatigue, and, when the demand for speed is long continued, more or less profound nervous exhaustion.

ORIENTATION

The Self	An Other	A group	The Herd

To orient oneself is to get one's bearings. Primitive man established his geographical orientation at an early stage of development. He turned upon the spot where he stood, and faced the rising sun. Then he directed his attention to the right, to the left, to the rear, up to the sky above, and down into the earth beneath, and thus his exploring attention discriminated the six principal directions, and adding the spot of orientation on which he stood, he derived therefrom the number seven, which filled him with such amazement that he has ever since ascribed to it a symbolical significance.

Look at any object, let us say the figure of a square, and you will find that your eyes and attention are directed by perference to one part, usually the bottom line, and after that the eyes and attention move upward over the rest of the figure, or around the other three sides of the square, beginning usually at the left and moving to the right. Tilt the square up on a corner, and it becomes to perception a diamond, which you will orient from its lowest point and explore by a movement of the attention upwards and from the left to right around the four sides. To make a square standing on one corner look like a square, you must orient one of its sides and then explore it as you would a square.

Orientation is the point of view from which the individual observes the performances, of himself and others, objects and ideas. The earliest and still most common orientation is egoism, which observes and values everything with an egocentric exploration. Self-interest determines much human behavior, and prejudice is often displayed in both thought and action.

We do, however, even though it be only at times, look at things from the point of view of an other performer. "Put yourself in his place!" This precept motivates the altrocentric exploration, which must be made the cardinal motivation of the psychologist. Altruism is an ideal for the control of the individual's behavior toward others; it is a rule of conduct, framed in the words "Do unto others as you would have them do to you." Altruism is therefore benevolent altroism.

We also look at individuals and things from the social point of view, by which I mean the point of view of a group of individuals, the family, the community, the nation, the race, humanity. What is called the social consciousness is another name for the social orientation. I have invented the word "sociatism" to distinguish group orientation from socialism, which is a theory or ideal of conduct to regulate and control social and individual behavior. Socialism in all its varieties claims to be benevolent sociatism, in other words, an attempt to do the greatest good to the greatest number.

EXPLORATION

Objects	*Performers*
1. Expansion	1. Superior
2. Seriation	2. Equal
3. Contraction	3. Inferior

The movement of attention, flitting from object to object, is an expression of the urge to do something no matter what. Persistent attention is an acquired ability to control the performer's own distractability, due to the multiplicity of urging initiatives, on the one hand, and on the other, to resist the distraction of multiple stimuli. It is the urgent quest of change and novelty, the exploration of attention and not its persistence, which predominates in childhood and youth, and often throughout life.

Persistent attention having particularized an object, the exploring attention may then proceed to particularize a part of the object. Attention thus moves from the whole to the part, as when we observe a man and then look at his head and features. Attention moves in the opposite direction from part to whole, as when we look from the man to survey a group of which he is one of the component parts. Contraction and expansion are characteristic operations of the exploring attention. Contracted particularization makes discrimination more definite and analytic. The expanding particularization of attention is not so productive of exact knowledge, but it has been fruitful in art and religion. It is the parent of romance, mysticism, and pre-scientific philosophy. If attention moves from one object to another, neither expanding nor contracting, as when we look around a room and observe one object after another in serial order, the exploration of attention may be called "*seriation,*" a term which I prefer to the current "association of contiguity."

Similar diversity may be observed in the direction of our attention to individuals. With an egoistic orientation, the inclination of each performer is to look upon another, either as a superior, an equal, or an inferior. This primal characteristic of attention has entailed consequences of great magnitude in the history of races and nations. It gives rise to emotional attitudes which cause perversity as well as diversity in human relationships. It is the parent of caste and other varieties of social stratification.

ASSOCIABILITY

Distribution of Attention or Memory Span

The memory span is really the ability of the performer to distribute his attention over two or more discrete operations or stimuli;—in other words, to particularize at one time several operations or objects. The memory span is a congenital characteristic, the primal associability, which makes the development of an intellect possible.

DISCRIMINABILITY

Qualitative		*Quantitative*		
Known	Strange	More		Less
Good	Bad	Most	Medium	Least

Discriminability is discernability particularizing and differentiating performances. Its simplest operation is naming things, a characteristic of infancy and primitive science. The observation of unlikeness is an operation of discriminability at a relatively low level of development. The teleological categories of the child as well as of primitive man are denotative, and are based upon the observation and discrimination of obvious contrasts. Love and hate are two such contrasting opposites. At a higher level, analytic discriminability discovers abstract qualities and the elements upon which generalization builds the connotative categories of science.

The primal judgment of qualitative differentiation was expressed perhaps in the words, "it goes ill," "it tastes bad," or "it looks strange." Doing, tasting and knowing, in the sense of reacting to the familiar and the strange, seem to have given rise to the primitive differentiation of good from evil. Motibility led man to the pursuit of power, sensibility led him to discriminating enjoyment, and together they motivated him to acquire knowledge, to systematize it in the sciences and arts, and then to organize it into instruments for his use.

To carry on an operation required the individual to exert more or less force to overcome resistance. Thence, no doubt, he derived his first quantitative discriminations. Wherever we employ such terms as more or less; greater or smaller, higher or deeper, better or worse, we estimate quantity however uncertain this estimation may be. Comparison is an operation of discriminability employing distributed attention. Comparison and discrimination are perhaps the earliest operations of the intellect. They require an adequate associability for their employment and development.

Even the primitive intellect added the superlative to the comparative degree. The five-point scale for the estimation of quantity is based upon primitive discriminability. Its psychological foundation makes it still the best and most practical scale of estimation.

Measurement is a method devised by man's intelligence and intellect to arrive at something more certain than an estimate. Without the yardstick and the balance, science could not have laid the foundation of modern civilization. It is impossible, however, to measure all the quantitative differences of performance, although we can and do express them as estimates. We may be quite certain that "A" dances more gracefully than "B," but there is no standard scale of measurement for grace. Most of the quantitative judgments employed in every-day life and even in some sciences are estimates and not measurements.

TRAINABILITY

The senso-motor reaction is a capability. The organism responds with a definitely particularized reaction to a stimulus. The reaction is exogenous.

A child, for example, has a congenital urge and also the ability to say A when he sees and hears some one else say A; to say B when he sees and hears someone say B. Memory will be displayed, if the child acquires the ability to say B when he hears A. His reaction has been modified. The congenital ability has been developed by training into a new ability. All training is based upon this simple procedure.

Trainability is measured by the number of repetitions necessary to establish an acquired competency. The ability to reproduce what has thus been learned is subject to the same laws of stimulation as the original ability.

RETAINABILITY

The competency of memory is dependent upon another congenital ability, the ability to retain, commonly called retentivity;—in fact, memory is essentially retentivity. It is conveniently measured by the rate of forgetting or by the amount forgotten over a given unit interval of time.

IMAGEABILITY

The boy who throws a ball against the wall and then secures it again on the rebound, initiates a movement of the ball and then reacts to the movement of the ball which he has initiated. The child, who has learned to say B when he hears A, says A to himself, but checks its expression and reacts to the inner but unexpressed operation, by saying B outloud. Thus originate endogenous reactions. The child, who has learned to say B when he hears A is in position either to say A or to say B when he hears A. The first reaction is congenital and exogenous; the second is acquired and endogenous. The endogenous stimulus of the acquired reaction becomes a part of the performer's initiative.

The exogenous reaction is a sense perception. The endogenous reaction is called an image, because it is discerned as a faint likeness of the exogenous reaction. The ability to have images, *i. e.*, the ability to initiate endogenous reactions is congenital. I call it imageability. It is measured in terms of motivating force and stimulated vividness. The relative vividness of an image may be discerned by the performer but its motivating force does not vary directly with its vividness and can be ascertained and estimated only from an observation of the performance which it initiates.

The training of imageability develops memory and imagination. Memory is imageability conformed to the exogenous stimulation. Imagination is unconformed imageability; it is eccentric reproduction. It is to be carefully distinguished from defective memory which also produces lack of conformity. The eccentricity of imagination is an expression of the individual's initiative. It creates performances and operations by initiating new combinations of acquired reactions. The creative imagination, solving new problems and producing results till then unknown to the performer, is intelligence. Intelligence, producing what is new to an entire civilization or culture, is commonly called genius. Cunning is a variety of intelligence. Talent is an unusual quantity of a particular capability. It always implies skill, which is a variety of proficiency, but it need not imply much intelligence.

ANALYSIS

Analysis is the characteristic intellectual instrument of European civilization in art as well as in science. The exploring attention contracts from the object first observed to some part of the object and arrives at elements and abstract qualities not further divisible by analytic discrimination. Teleologically, the analytic elements of psychology are the congenital and acquired abilities. Etiologically, the element is a psycho-motor reaction, and the first inquiry into the etiology of stimulation concerns itself with the discrimination of the specific sense energies.

GENERALIZATION

Contracted particularization and discrimination disclose a multiplicity of discrete elementary qualities. Like qualities are grouped as a species, subsumed under a general term. Red, yellow, green and blue we call colors, living and moving creatures we call animals. Generalization is a scientific method but it is a primary intellectual operation essential to the systematization of knowlege.

CLASSIFICATION

Scientific classification is an intellectual instrument invented by man only after he had arrived at an advanced stage of civilization. Primitive man and the child classify by contrasting opposites. The good is thus differentiated from the bad, the familiar from the strange, the bitter from the sweet, the beautiful from the ugly, and the true from the false. These primitive categories still play an important rôle in thought and speech. More useful categories have been developed by the advance of civilization and science, which has perfected analytic discrimination as an intellectual instrument. The thoughtless girl, to whom everything is either lovely or hateful, is categorizing at the intellectual level of primitive man.

The discovery that qualities constitute a continuous series and the employment of this discovery in the motivation of thought and action has been an important agent in the development of civilization. "Black is not white" is certainly a wise judgment. But those who make it often fail to recognize that between the blackest black that ever existed and the whitest white, there is a continuous series of grays, of which black is only the darkest gray, and white, the lightest.

To draw a line between what is good and what is bad, between success and failure, often serves a useful social purpose. It establishes what I call the social criterion, the line that separates the feebleminded, the insane, and the criminal from the normal man; but the psychologist recognizes that there is no gap between these groups, and the point on the scale of performance, which is cut by the social criterion, is arbitrarily determined and in fact wavers to and fro as social standards and economic conditions vary.

DEFINITION

Definition is also an intellectual operation and a scientific method. It is a statement of the qualities which suffice to distinguish one class of objects from another.

THE INTELLECT

The intellect is knowledge put to use. Information tests do not necessarily test intellect. They test the efficiency of memory and indicate an intellectual level. It is conceivable that one might know all the definitions in the dictionary, all the dates of history, and the contents of an encyclopedia, and yet have no more intellect than a scrap book. Intellect is displayed by the knowledge employed in performance. The use to which knowledge is put may be only to earn one's bread and butter, it may be to acquire more knowledge as in science, or to create objects of enjoyment and invent instruments of power as in art.

Knowledge leads to power, to enjoyment, to both, or neither. The intellect is an acquired instrument; it is organized knowledge employed for acquisition, appreciation and enjoyment. Congenital abilities make intellectual organization possible. An intellect is acquired by training or practice in observation, description, discrimination, analysis, generalization, definition and classification. By the time a child is six years of age, if he is going to have an intellect worthy of the name he will already have displayed, on his own initiative, all these elementary operations, which are called scientific methods only because science perfects what nature gives. If our education were not so defective, it would be unnecessary to *teach* these methods to college and professional students. The child employs them. He does not need to be taught them; he needs only to be given an opportunity to exercise the capabilities with which he is endowed at birth. If the intensive training of his memory trains these intellect-forming methods out of him, and leaves him at a low intellectual level, bereft of the creative imagination which is intelligence, it is then the thankless and often hopeless task of higher education to awaken what is dormant or dead.

NOTE.—On the following pages I give an outline of Part I, The Teleology of Competency, and suggest the contents of succeeding parts of my psychology. Every competency may be subdivided into an indefinite number of particular abilities. The number of abilities to be discriminated and named will depend upon practical considerations. A classified list of thirty-one capabilities suffices for my present purpose. The further teleological analysis of competency will necessitate an adequate differentiation of varieties and compounds.

PART I

The Teleology of Competency

EXCITABILITY

EXPRESSIBILITY	SUSCEPTIBILITY

A. VITALITY: MENTALITY

Emotives and Directives

Mood		*Desire*	
Wish[1]	Dread[2]	Want[3]	Aversion[4]
Passion		*Feeling*	
Sympathy[5]	Antipathy[5]	Pleasure[7]	Displeasure[8]
The Start		*The Guide*	
KINESIS: MOTIBILITY		AESTHESIA: DISCERNABILITY	
To Promote[9]	To Oppose[10]	To Get[11]	To Eject[12]

B. POWER: MENTABILITY

Initiative	*Guidance*
Competency[13]	Efficiency[14]
Eccentricity[15]	Conformity[16]
Control[17]	Direction[18]

C. INVENTION: INTELLIGENCE

The Competency Grade	The Operative Levels

D. CONTROL: JUDGMENT

Quantitative		*Qualitative*	
Failure	Success	Abnormality	Normality

E. FORCE: ATTENTION

Alertness[19]	Persistence[20]
Speed[21]	Endurance[22]
Play[23]	Work[24]
Exploration[25]	Orientation[26]

F. ORGANIZATION: ASSOCIABILITY

Discrete Multiplicity	*Integrated Multiplicity*
Multiple Personality	The Individual
Distributability[27]	Unitability[28]

Trainability[29]
Retainability[30]
Imageability[31]

Imagination	Memory

G. DIRECTION: INTELLECT

1. Observation
2. Comparison
3. Discrimination
4. Analysis
5. Generalization
6. Classification
7. Integration
8. Description
9. Definition
10. Intellectual Levels

NOTE.—The numbers 1–31 indicate the congenital and elementary abilities; i. e., the capabilities.

PART II

THE ETIOLOGY OF EFFICIENCY

Reactions and Stimuli, including the educational treatment of normal and exceptional children.

PART III

THE SOCIAL CRITERION

Ability and Defect, Competency and Deficiency, Normality and Abnormality.

PART IV

GROUP PSYCHOLOGY

The family, races, nations, and humanity. Adventitious groups.

NOTE.—I am not ready to offer Parts II–IV even in outline, but our courses in psychology at the Summer Session of the University of Pennsylvania not only supplement the outline of Part I, but also cover many topics belonging under the headings of the other three parts.

THE ANALYTICAL DIAGNOSIS

By H. J. Humpstone, Ph.D.,

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In arriving at a final diagnosis in a clinical examination the examiner should be able to state the specific defects and abilities of the individual and give some estimate of their extent. No matter what tests are used, whether the estimates are stated or not there is in every examination an analysis of the performances of the subject, and the interpretation is made in terms of specific abilities and defects. Every qualified clinical examiner must have as a background an intimate knowledge of Psychology, especially of that part of the science which we know as Clinical Psychology.

Contrasted with that larger background there are certain specificities which the examiner must be able to recognize and upon which ratings must be made. If the subject shows defects in one or more of these, there still may be compensation through others. The mentality is a complex; it is not to be determined by the score of any one test or of a set of tests, however significant such a score may be. We have used the following schedule of capabilities in the teaching and practice of clinical diagnosis, and have found it to stand the test of use for both purposes:

VITALITY

1. Energy.
2. Rate of Discharge.
3. Endurance (Resistance to fatigue).
4. Health.

MOVEMENT

5. Control.
6. Coordination.
7. Initiative.
8. Responsiveness.
    (*a*) Complexity.
    (*b*) Vivacity.

ATTENTION

9. Concentration, analytic.
10. Concentration, persistent.
11. Distribution.
12. Alertness.
13. Interest.

SENSATION

14. Sensibility: visual, auditory, kinesthetic, pain, general.

IMAGINATION

15. Imageability.
16. Associability (memory span).
17. Memory
    (*a*) Trainability.
    (*b*) Retentiveness.
18. Understanding.
19. Planfulness.
20. Observation.
21. Intellect.
22. Intelligence.

These are congenital *capabilities*. They are developed as the child grows and may be trained by exercise and guidance. They atrophy for want of use and are impaired by improper training. At each stage of development certain *abilities* may be displayed in a *performance*. We estimate the amount of each ability and give a rating upon the five-point scale. From these ratings we may make a general estimate of the mentality and give a diagnosis accordingly.

Energy refers to the quantity at the disposal of the individual. It is not as easy to estimate as the rate of discharge which is shown in the movement and responses made in the performance. Endurance, or resistance to fatigue, must be distinguished from boredom, or loss of interest in the task set. Health must be taken into consideration in making any estimate of the other specificities, because the condition may be only temporary or it may permanently modify the ability.

Control is the ability to employ a capability to accomplish a result. Walking, talking, the larger muscular movements, which give success in performance are included under control. Coordination is the organization of the muscular elements necessary to produce a successful performance. Initiative may be shown in the way the problem is attacked. Often, for instance, a child will pick up the blocks or other apparatus before he is told to do so. In their responsiveness, again, children show differences in the complexity and liveliness of their movements or the language they use.

In giving attention one may select one small part and concentrate on it, or he may successively, yet rapidly attend to the several parts. Young children and low-grade feebleminded ones show this distribution by their movements. Some do not concentrate long enough to accomplish the task or solve the problem. Persistent concentration of attention is a very important factor in success. Alertness is expectant attention, an attitude of readiness. Interest is emotionalized attention.

Sensibility may be directly measured by careful tests, or may be inferred from the reactions to different stimuli. One may have apparently perfect sense organs and yet have little sensibility.

Under the heading of imagination is placed first imageability. This is the ability to have correct images in any sense field. If a child is blind from birth it has no visual images. Associability is the ability to distribute attention over a number of discrete images and is generally called memory span. It is really an after-image and is not memory nor does the usual test for this ability test memory. Memory is a specific form of imagination and presents two aspects which can be tested. Trainability refers to the ease with which the child learns and is measured by the number of repetitions necessary to fix the material, while retentiveness refers to the permanence of the modification and is measured by the length of time the material is retained or by the amount retained after the lapse of a given time.

The remaining specificities are imagination complexes of different kinds. Intellect is the ability to use knowledge either for pleasure or to gain new knowledge. Intelligence is the ability to solve what for the individual is a new problem.

The mental examination should employ tests designed to elicit performances which will enable the examiner to estimate all of these specificities, if the performance is interpreted in the light of the history of the performer, his environment and opportunities.

THE PROBLEM OF EDUCABILITY

By Lightner Witmer.

The United States Commissioner of Education called a conference recently in Chicago, of persons particularly interested in the field of elementary education, to consider what changes were necessary and practicable in order to improve the elementary school system of the country for the purpose of meeting after-war conditions in a satisfactory and scientific manner.

At every point, it seems to me, from the kindergarten to the professional schools, from the four-year-old level up to the level of the graduate student, our school system can be improved by a change of aim, content and method.

At two points, the elementary school system needs immediate and thorough-going reconstruction. These two points are the proficiency level of the first grade, and the proficiency level of the working certificate. The former is the age level of the child of from four to six; the latter the age level of the boy or girl of from fourteen to sixteen. On the intellectual scale, these levels may also be designated literacy levels: the first grade level being the competency level of literacy, while the working certificate level summarizes the efficiency standard to be attained in reading, writing and arithmetic before the boy or girl is released from school and permitted to go to work.

Below the competency level of literacy are all those who cannot read, write and cipher. They have not yet proved themselves to be possessed of the mental abilities necessary to acquire an elementary education in the three R's—they are the illiterates—a very large percentage of the population of even civilized countries. Among them are uneducated adults, normal perhaps, but a potentially dangerous element in a democracy; children who have not yet reached the school age; foreign-born and other children who have not yet attended school long enough to enter even the portals of an elementary education; and, finally, many feeble-minded children and adults who are congenitally illiterate and uneducable. Most of the so-called backward children in our schools are not backward, but feeble-minded; some of them are trainable, but many are merely custodial cases, not even trainable. The spectacle presented by our schools trying to educate uneducable children would be a scientific scandal, were elementary education a science. As it is, nobody expects the school to diagnose its children accurately, or to base an expert educational training upon what may be known of a child's capabilities and defects.

I approach the problem of educability from the standpoint of the Clinical Educator. Every "attempt to teach" an individual child is a "psychological test." The performance of each individual can be measured and the result expressed in such exact terms that the performances of different individuals may be accurately rated on standardized scales. Only in this way can we learn whether a child has enough ability to be worth educating. Only after tests have been applied can we find an answer to the insistent query: "How many children otherwise normal are congenitally incompetent to acquire the three R's, whether as a tool for learning or for use in life?"

Every first grade pupil beginning to learn to read, displays to the Clinical Psychologist and Educator a measurable competency, partly congenital and partly acquired. Among the many abilities, constituting this competency to read, are eyesight, hearing, articulation, attention, memory span, retentiveness, imagination and intelligence. The greater the pupil's comptency, the more quickly will he learn to read. After he has learned to read, practice may give him more or less efficiency in reading up to any established standard of efficiency.

The first grade standard of efficiency in reading is approximately zero—a pupil learns to read on his congenital and acquired competency. With the second grade he begins to acquire efficiency in reading. What is our standard of efficiency for reading in the sixth grade? It should be precisely defined, for children are being denied the right to work because they have not attained this standard. How many fail to reach this standard of efficiency, because they cannot reach it, owing to deficient competency, or in plain words, "lack of ability." Is the percentage of congenital illiterates in the schools a large one? Some school men will not even understand the question, to say nothing of being able to answer it. You will assent to the proposition that it is a foolish waste of time to try to teach children to sing who are tone deaf, or to train color-blind boys to be locomotive engineers. We are forcing word-blind and word-deaf children to try to get an education they can never get, and at the same time refusing them the training they could put to good use in what, after all, is the chief business of life, *i. e.*, to earn a living.

The object of the elementary schools is to train children to adequate proficiency in reading, writing and arithmetic. The first grade level of proficiency is reached by a pupil if and when he gives convincing evidence that he has the competency to acquire reading, writing and arithmetic. Forty per cent of all children between the ages of four and six can learn, in my estimation, to read, to write, to add, to subtract, divide and multiply up to twelve on thirty minutes' instruction per day, five days a week for nine months. The best ten per cent can even do better than this. Two weeks ago I tested at the Psychological Clinic of the University of Pennsylvania a little boy four years and three months old. He gave a memory span of six. He learned in one trial to do my Cylinder Test of Intelligence, and he gave the following record of performance as a result of only fifteen minutes of instructon by the diagnostic procedure: "'Are you a girl,' I said?" "No," he answered. "Good, write your answer on the board." He wrote on the board the word "no" in script. "What shines at night," I went on? "The moon." "Do you know how to spell 'moon'?" "No." "M-o-o-n," I told him, "now write it on the board." He had never before attempted to make a script letter, but he was able to write the word "moon," thus demonstrating the value of the diagnostic procedure in teaching. At command he made a vertical stroke (I had just a moment before taught him the difference between horizontal and vertical) then at command he made:—"From the bottom of the vertical stroke a short horizontal stroke to the right." When I asked him what letter he had just made, he did not know. He had learned to make the capital print letter "L" before he had learned to recognize it. I estimated from the results of fifteen minutes of diagnostic teaching, that I could teach him to express some of his thoughts in simple written sentences within three months' time, when he would be four and one-half years old.

Last November I sent to the first grade a boy who was five years old last July, because I discovered he was exercising his intelligence chiefly to "beat the game," that is to say, he was acquiring great skill in avoiding mental effort. This boy has been in my professional care since he was two years and seven months old, when I took him for educational treatment, apparently a feeble-minded child. He had then just begun to walk; he had a vocabulary of eight words, and during the first two weeks his best spontaneous observation, as recorded in my notes of the case, was to look at his teacher through an empty picture frame he was holding in his hands. After five months of clinical teaching, at the age of three years and two months, I put into his hands a copy of Monroe's Primer which he then saw for the first time. As I pointed to a line for the purpose of testing him, he correctly read the words: "A cat can see a dog."

At the opposite pole from these children, the poorest ten per cent can perhaps never learn to read, write and cipher. Their competency is below the literacy level. You may teach them, or pretend to teach them, the three R's but you will not be able to give them the three R's as educational tools. You will give them only an "accomplishment," as you may train your dog to walk on his hind legs.

If you do not agree with me that it is absurd to try to educate uneducable children; if you do not believe that it is destructive to the competency of competent children to make them take the slow and labored pace of the incompetent ones, at least you will agree, I hope, that until the competency of each child is measured when he first goes to school, you will not begin to understand the educational problems involved in the acquisition of reading, writing and arithmetic. The public schools are teaching the three R's to children very much as our grandmothers doctored them before the scientific physician came with thermometer, antitoxin and the trained nurse. I assert that it is possible to measure with ease the competency of every child to acquire reading, writing and arithmetic, before he enters the second grade. I affirm that when you come to make this test you will find that fifty per cent of all children can learn to read, write, add, subtract, multiply and divide up to twelve before they have passed their sixth birthday and they can do most of this as play and all of it as an hygienic exercise for both mind and body. The time for this work is before the child is six, and not afterwards. Every child who cannot pass the competency test in the three R's set by the diagnostic procedure in education, should be separated for the second and higher grades from the fifty per cent of competents, in order that he may not obstruct the progress of his more highly endowed brothers and sisters. He should also be provided with a different curriculum adapted to his abilities and defects. These reforms would come into practice at once, as a result of an overwhelming demand, if Clinical Tests and Measurements were employed by the schools to discover and eliminate the incompetent, for the results would make plain what an enormous waste of time, brains and effort our present indiscriminate mass education is demanding from both child and teacher.

A second point in our school system, where clinical measurement is indispensable, is at the fourteen-year-old level, when the boy or girl is refused his release from school in order to go to work, because a sixth grade or some other standard of proficiency has not been reached. If the public schools are to justify themselves before the community, they must see to it that they undertake the scientific educational treatment of the children to whom they refuse permission to go to work. Some children were dragged from remunerative employment last year, who were earning more than the truant officer who seized them, and nearly as much as the teacher into whose hands they were put for educational treatment. I am a friend of the schools, and I believe in upholding our compulsory education law, but nevertheless when I am consulted as a Clinical Psychologist I am often compelled to advise parents asking for the vocational guidance of their backward but normal children, children ready and willing to work but unwilling or unable to learn, that the schools are a degenerating influence, a worse place in many instances than even the streets. I am compelled, as a scientific expert, when parents of extra bright children, six years of age ask: "Would you advise sending my little boy or girl to the first grade?" to answer emphatically, "No, your child has a good mind, the public school may ruin it." This situation can be changed, but it will not be much changed for the better, until the orientation of the Clinical Psychologist is accepted by the schools, and they proceed to measure the competency of the beginner, and to ascertain the efficiency possibilities of the child who is not allowed to depart in peace to begin to make a living.

When the Commissioner of Education invited discussion of the changes in the elementary education of the country required for greater efficiency, he specified changes in aim, content and method. He did not specify the factor charged with higher potency for progress or for obstruction than any one of these *i. e.*, the personnel. Clinical education will need to develop a new personnel orientated in clinical psychology, and trained to employ diagnosis at every step in the educational treatment. Until that personnel is chosen and trained, no real progress can be made. When the personnel arrives and begins to work, obstruction, stupidity, ignorance and inefficiency may still negative its every effort. You cannot become a clinical educator as you may join church. Something more is needed than a change of heart, though this would help mightily in some quarters. The best ten per cent of our children do their school work at the level of the mediocre, because the worst ten per cent is neither discovered nor eliminated. The best ten per cent of the personnel cannot function at its own level of efficiency, because it must meet the requirements of a prescribed course of study administered by a prescribed group of supervisors, many of whom are well below the proficiency level of the mediocre. The testing and rating of the personnel will throw into the foreground the ten per cent group, who, because of incompetency, obstruction, ignorance or inefficiency, will have to be eliminated before the school system is able to put into advantageous and efficient operation the newer methods of clinical examination and educational treatment which stand ready for adoption.

THE EDUCABILITY LEVEL

The determination of competency to do the work of the first school year.

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The ———— Kindergarten was chosen as the place of this experiment because of its accessibility and because it was free from the requirements which a Kindergarten in the city system would have had to meet. The neighborhood in which this kindergarten is located is one of the worst in the city, and the children coming from the homes in this district are not representative of the great mass of children entering the first grade. There were thirteen children in the class. Of these three were from Polish homes where the language was predominantly Polish, and two from Yiddish homes, where the foreign language was spoken. One child came from an Italian home but in this case the family all spoke English.

The children with whom the experiment was made were all past five years of age. Four were six years of age, and one was seven. The kindergarten where their training for the past year has been, is a most attractive place, with the best of pictures on the walls, a piano, goldfish, plants, and clean walls and floors. The teachers are well-trained in kindergarten work. A lunch is given to the children in mid-morning, accompanied with a glass of whole milk. The conditions as far as the kindergarten is concerned, are excellent.

The aim of the experiment was to determine as far as possible the number of children who will be able to do the work of the first grade when they enter school in the fall of 1919. The method used was teaching the children by means of material which was available at the time, material often used merely as test material, but which is as truly valuable for didactic use. This included the Witmer form-board and cylinders, the Healy puzzles, both A and B, the Knox series of puzzles, three-, four- and five-piece picture puzzles, picture puzzles of animals and birds of from twelve to fifteen pieces, and picture puzzles of much greater complexity. With these were included color cubes, sticks, primers and anagrams. It was not the purpose of the experiment to continue teaching beyond a point where it seemed that the child was able to clearly indicate his ability to progress. Time and a Board of Managers conspired to limit the length of the experiment. Altogether, three weeks' instruction of forty-five minutes per day were given.

With the exception of two cases, the homes of the children were very bad. The general standard of living for all was very low, in one case the mother is a prostitute, and the conditions which follow this surround the child. In two other cases this is suspected, and the tone of the family is low. In two cases the father and mother fight to the scandal of the neighborhood; in another two cases the mother is a widow and having difficulty in keeping the family together. The children, with perhaps three exceptions, are poorly nourished. Two are positively ill, one is obviously feebleminded and in poor physical condition. One child is a victim of syphilis. Pediculosis abounds among the children and one child has eczema.

The children were introduced to the Witmer formboard. But one child failed to perform this test correctly the first time. This child was able to complete the test correctly the second time without teaching. The children were uniformly successful with the cylinder test. No attempt was made to hasten the performances, and no time limit was made. The test was given the child and he was left to his own devices until he had completed it, the only requirement made was that he should continue his work until it was finished, or until he appeared fatigued to the point where the test was of no further value as didactic material for the time being. Later he would be given the material a second time, or more if necessary. No instruction was permitted. The same procedure was followed with the Knox and Healy tests and with the picture puzzles. In every case, the children found these a source of delight. The rapid workers were able to conquer four or five of these tests in a period. Slow workers often spent an entire period on one test, but it was to their own satisfaction as well as to that of the experimenter. A regular series of graded material was given with the color cubes, the whole class working together. With the exception of three who were absent, all of the children were able to do some of the designs. The first design was a solid color square of four cubes, the second a square of alternate colors, the third a square within a square, the fourth a chevron, the fifth a line of one color across a square of a solid color, and the sixth a zigzag design with eight blocks, really formed of a double chevron. Six of the children did the entire series, two, all but one of the series, one the first three of the series and one the first two. Neither of the latter were able to finish more than those they had finished the first day, and none of them liked the material. Of the three absent, all could make the more difficult designs on other occasions when the graded series were not used. With the exception of one child, all the children were able to put together picture puzzles of fifteen pieces. One or two on account of illness were unable to try this series.

With the exception of one child, the memory spans were either four or five, and one child had a memory span of six. The poorest child had a memory span of three, and this could not be raised to another digit in ten trials. The other children all had good enough trainability to raise their memory span in digits to the group one higher in less than ten repetitions.

Only the best of the group were able to put together the larger picture puzzles. These were the children who had the best memory span and the best trainability. There were six of these children. None of the other children wished to try the more difficult work, asking often for the formboards rather than the picture designs. Of the successful group two were six years old and the remainder five.

All of the children could count at least to five. They were able to lay out sticks or use other objects as counters, and to compute their small combinations up to that limit. Only the best six were able to state at once what two and two were, and how many were left from three when one was taken away. The others could count it up and find out, but did not seem to get the idea without counting. The time consumed in the practise of this sort of thing was not great enough to warrant the judgment that the others might not be able to learn their combinations in this way. With anagrams, the children learned to pick out letters when shown a model, and to make words with the letters when a model was before them. Six of the children appeared interested in this kind of work, but not to the extent that is common among the children of a first-class first grade, and the others paid no more attention than was strictly required of them. One child did not learn any of letters or words, and one learned a good many more than was required, asking for information.

All of the children had been this present year in the kindergarten, most of them were there last year, and one from the year before. The kindergarten teacher stated that the children were bored with the regular work, and she was somewhat at loss what to do with them. Much of the work given to the children was games and free play. It was early noted that few of the children actually took part in the singing, and little effort on their part was expended in keeping place in the line. In fact, much of their training seemed to fit them for performing an act automatically without paying the slightest attention to what they were doing. The children did not pay attention to their mates, but gazed around the room, ran to the toilet, and in other ways withdrew into their own cosmos as much as possible. As a result of this, the attention of the children was easily distracted, and a large part of the effort expended upon them had to be directed toward the end of securing some concentration of attention. The order was of the usual kindergarten "free play" variety, and it was necessary here to subdue the children to some degree in order that work of a sort might be done. The work was much aided by the director of the kindergarten who tried to get the children actually to do the work rather than to appear to do it, and some marked changes, especially with one boy, were made during the experiment.

The kindergarten teacher reported but one child of the group really able to tell her a story after having heard it. She reported several children unable to give the English names of the most simple of the childish imitations made in the songs the children played, although the movements had been made to order. Five of the children came from homes where only a foreign language was spoken, and one of these children was particularly to be noted in her lack of the English tongue. None of the five gave promise of ability up to the point necessary for the first grade, and with the further handicap of lack of language it seems improbable that they will do well in school.

Besides the five children previously mentioned in regard to language deficiency, two more of the children are physically unable to compete with others in the grades. They do not now average more than fifty per cent attendance at the kindergarten on account of their physical ailments. One of these particularly is in extremely poor condition, and the home conditions are such that little hope can be given for co-operation in this quarter. There is a Dispensary at the Deaconess Home, but it is reported that it takes a long time to get the people to a point where they are willing to send their children there, the general feeling among them being that a child taken to the hospital is already dead. One other child, he of the three memory span, is well past six, and yet of much less development mentally than any child of the group. He belongs to the group who do not speak English at home, and is deserving of special mention because of the added mental disabilities.

Six of this group of thirteen children are able to do school work. Seven do not now seem of sufficient mental or physical development to warrant their placement in a regular grade. Bad habits can be eradicated, but the real disabilities of language deficiency and physical inadequacy are not considered in the first grade, and will tend to force these children into special classes, or prevent them from making regular progress in the grades.

Reports of Individual Children.

Julia—Gave an excellent performance with the formboard the first day. Her cylinder performance was good for her age. Her memory span is five with six on five repetitions. After fifteen minutes she was able to do Healy B.

Julia is five years, two months old. She is a tall thin child, easily excited. Her home is fairly good, and some effort is made to care for the child physically, but she is out to the movies several nights per week, and the staple articles of her diet are coffee and bread. At the kindergarten she has a glass of milk and a piece of bread in the middle of the morning. Her tonsils are slightly enlarged and her teeth in need of care. The most noticeable characteristic which she shows is easy distractibility of attention.

Julia showed no interest in attempting to learn words or letters when tried on the second day. Her attention could not be held to the task of learning A, B and C when she was a member of a group as was necessary under the conditions under which the experimenter worked. Responses were made as somebody else, equally inattentive, responded. Since this condition seemed to be a matter of training, both at home where the children ate and slept, and at the kindergarten where they played games in which no great effort was made to require attention, Julia was given material which she could work on individually, and which it was hoped would prevent her, through its interest, from permitting her attention to wander at every stimulus. To this end, the Knox series of puzzles were given her. These she easily conquered in two sessions. Next she did picture puzzles of three, four and five parts. From these she graduated into picture puzzles of from twelve to fifteen parts. No encouragement was needed with the Knox tests. She liked to do these, and would spend the forty-five minute period working these out without asking for anything else to do, running to the toilet or any other of the thousand and one devices she had used the previous two days to avoid trying. Praise was the incentive used to get her to try more elaborate picture puzzles, for these required a sustained effort on one thing longer than she cared to maintain. Long after some of the others refused to play with the Knox puzzles, she still tried to spend all her time upon them. The color cubes were distasteful to her, and it was only after she was firmly told she had to try them that she would touch them. Then she succeeded in making a solid color square, a square of alternate colors, a square within a square, a chevron, a line square, and the zigzag. After discovering how well she could perform these tests, she volunteered to make designs given on the cover of the box, and succeeded in reproducing three of them.

After having secured the necessary attention for the mechanical tests, Julia was able to sit down before a box of anagrams, and pick out any of several letters—A, B, C, I, O, R—at call, and to spell and write with the letters the words, it, is, cat, rat. She also learned to count to twelve easily, to count backward from five to one, and to give the number combinations up to five easily, counting out the results if she failed to remember. Her teacher co-operated in teaching her to hold her attention on one thing until it was done, and reported a marked improvement in her behavior both in the circle games and in the table work which she gave the children. There seems no reason to doubt that Julia is able now to continue her reading with some interest to herself and to profit very well by first grade work next year.

Anna—Gave an excellent formboard performance. Her cylinder performance was good for her years. Her memory span was six digits the second day, while the first day she said five with two repetitions for six. She did the horse and colt picture puzzle with no difficulty the first day, but did not succeed on Healy B.

Anna is six years, five months old. She is probably normal for height and weight. She has enlarged tonsils and teeth which require attention. She has lost her milk teeth incisors. She is always tired, with deep lines under her eyes, and a wearied expression on her face. Many times she seemed too tired to work, and was left pretty much to her own devices. Her mother runs a house of prostitution most of the time. Just now the Deaconness Mission is trying to reach her, and there is nobody in her house at present other than the family. She drinks a great deal, and it is thought gives Anna liquor. The father is a fairly good man. Anna is the only child. Bedtime hours are unknown to her, and movies and constant excitement seem to be the reason for her fatigue.

Anna easily succeeded in doing the Knox tests, the cut-up picture tests, and was the first child to put together the larger picture puzzles. She learned to count to ten the first day. She was the only child in a group of six who had attention sufficient to really learn letters and words in a group. She was given a primer and permitted to read a few sentences every day. In the three weeks, she completed twelve pages of the primer, and could easily have done more, but little effort was made to teach her. She learned to count from five to one and the number combinations from one to five in one lesson. She did the various combinations with the color cubes with ease, but refused to try to make a design with sixteen blocks when the others did, and contented herself with aimless play which was not interrupted. From a mental standpoint there is no reason to suppose that Anna cannot do first grade work well when she enters school next fall. From the physical standpoint there is reason to doubt her ability to stand a long day in school unless her health is built up between now and then. Because of the peculiar situation in the home, the teachers at the kindergarten have not urged the parents to change their treatment of Anna, as they fear the slightest criticism will drive the family from the mission and thus leave Anna in a worse situation.

Rosie—With the exception of a confusion between blocks Nos. 7 and 11, Rosie completed the formboard successfully. She was very slow in doing it. Her cylinder performance was good. Her memory span the first day was three, but the second day she got four. The first day, Rosie seemed utterly unable to give four digits, but alone the second day, she did. This was due apparently to her generally slow thinking, for the first day there was a group around the experimenter. She learned to distinguish her right hand from her left. She was not sure about it the second day, but later did not confuse them.

Rosie speaks Polish in the home. Her home is immaculate, and Rosie is the cleanest and best-dressed child in the kindergarten. She has excellent physical care at home, for she is in the pink of condition, even her teeth and throat are well cared for. When most of the other children were suffering from colds, Rosie had none, and pediculosis was unknown to her, although treatment had been given the other children for this trouble. The kindergarten teacher says that Rosie has not yet learned ordinary English words, although she entered the kindergarten last September. She moves her mouth when the other children sing, and also when they say grace before drinking their milk, but does not say a word that the others are saying.

Rosie was tried very early with A, B and C, and although she had drill every day with blocks, printed letters, the black-board or other devices, she did not learn the letters so that she was sure of them during the three-week period. On the contrary, she learned the word Fannie, and did remember that so that she could point to it in a book. She was always interested, especially in books, and would look at books by the hour if permitted. There was no distractibility of attention, just a general slowness both in movement and in mental processes, so that the other children all were able to do about twice as much as Rosie in the same amount of time. The third day Rosie did Healy A and B and the horse and colt puzzle. In succeeding days she mastered the Knox puzzles, and the simpler picture puzzles—but was never able to get the larger ones. She worked with the color cubes faithfully, but was never sure of either the square in the square, or the chevron, and did not even try to do more difficult ones. She patiently sorted letters, but was never sure of the names and without the help of a neighbor was never sure of five sticks or other objects, although all right on four. She counted to five, but did not succeed in getting to ten. She did not know the number combinations, but could pick out her little sums up to four with some objects, and then give the correct results. Her persistency of attention was wonderful, and worked long and painstakingly at her tasks. If given time, she eventually conquers, but with the ordinary child of her group she is no competitor for she requires nearly twice as long for a single task as does any other child working with her. To expect this child to enter first grade and get along with her work at the same pace as the other children is to expect more than she has any chance of doing. She will try her best, but speed is not there. Her poor language training is a decided handicap, but that too is a question of her own mental quickness, for other children as young as she and in kindergarten for the same period of time have learned far more English than has she, and their language handicap was no greater than hers, and their national aptitude the same as they too are Polish. In short, Rosie is a nice-looking, Polish child, handicapped by lack of English, and of a mental equipment not sufficiently quick to enable her to perform the tasks of the ordinary child with his ease and rapidity.

Florence—Gave a good performance with the formboard, the only hesitation being on the eleventh block. Her memory span was four, with five on five repetitions. She failed the first day with the picture puzzle of the horses heads.

Florence was five two months ago. The home is maintained by the mother and three older children, the father having deserted when Florence was a baby. The mother means well, and has done very well to keep her family together. The home is not clean—Florence had pediculosis two weeks ago—but the family is a hard-working one. Florence is in good physical condition, except for badly decayed teeth. Her throat is in good condition and she appears to have plenty of good food, and to get to bed at reasonable hours at night. She is not permitted to attend the movies as much as are some of the others. She is badly disciplined at home, as she is the youngest, and the pet of the family. She sulks if she does not get her own way, and is frequently in disgrace at the kindergarten.

Florence was a bit slow with the Healy and Knox puzzles. She tried the Healy A and B and the Knox moron and imbecile tests several times each before conquering them. She liked to work with them however, and persisted in her efforts, frequently going off by herself to work. There was no evidence of an easily distracted attention, on the contrary, it was very persistent and the analytic concentration was also good. She was just a little slow at getting the material worked out, but she always wanted to do it by herself. She counted to fifteen and easily learned to count backward from five to one and to form combinations up to four. She showed no interest in this sort of thing, and had to be punished in order to get a response from her. When the puzzles were given her, she worked willingly, but any attempt at teaching which required direct answers, she utterly refused to give without pressure. She was among the first to put together the more complex picture puzzles, and showed herself capable of completing any of them in a reasonable time. She learned to tell her right hand from her left, but failed to respond to any sort of work with the letters. She was willing to sort them, but never inquired their names, as did the others. There was no response to a stimulus toward reading during the three-weeks period. As the child seemed able to conquer worlds of her own, it is likely that further work with difficult forms will bring her to the point where she will desire to read. The stimulus for reading is sadly lacking with all of these children as the home does not offer anything in the way of training for the children, and it is only recently that stories have been introduced to them in the kindergarten, and they fail to capture the interest of this child.

Frank—Gave an excellent performance with the formboard and the cylinders. His memory span was four, five on two repetitions. He could not count at all the first day, but readily learned to count from five to one and from one to five. He had no difficulty in solving five picture puzzles of from three to six pieces each the first day, and learned two words.

Frank is five years ten months old. He is a tall, well-nourished child showing unusual nervousness and poor attention the first day at the kindergarten. Unless a task was very short, he was reaching for something else to do before he had completed the first task, and he was in and out of his chair half a dozen times in five minutes, lying on his stomach on a table, and racing to the toilet if he could think of nothing else to do. It was impossible to hold his attention long enough to really get anything from him the first day or two, although his teacher made every effort to keep him busy. He readily learned, but to keep him busy with a group required the utmost effort because of his constant movement and talk. It seemed that nothing could be done with him unless this was conquered, so he was fed with a constant stream of puzzles, and required to finish each one before another was forthcoming. By the second week he was interested, and after that there was no further trouble. He did the hardest things easily, and with the co-operation of his teacher, he had been required to stop his constant call for new stimuli. There was little question that the whole difficulty with Frank was one due entirely to the kindergarten itself, which offered too little mental content to keep an active child properly busy. His teacher early marked his improvement. The second week was entirely occupied in teaching Frank to control himself by furnishing him something to do so that he could do so. He completed every puzzle during this period and learned to match dominoes also.

The third week, Frank learned words enough to complete three pages in a primer and five or six letters of the alphabet. He was eager for this sort of thing, and worked hard at it. He learned right and left, and continued to count, so that he had an ability to count to twelve and probably much farther. He easily learned the combinations to six, and there seems to be no doubt of his further ability along this line. Frank was also handicapped by the fact that his parents speak Italian in the home, although they are able to speak English. The home is good, the teacher reporting it the most "normal" home of any of her children. Frank is in excellent physical condition, and there is no reason to doubt that he will do well in school if he has half a chance.

John X.—John did the formboard successfully without help, but showed considerable confusion with Nos. 5, 7 and 11. He succeeded with the cylinders. His memory span was four, with five on seven repetitions. His attendance was extremely irregular, so that he did not get as systematic a series of material as did some of the others.

John is seven years ten months old. His father has been dead two years, and the home has been in a wretched state at least since that time. The mother tells wild stories of events which happen to her, but the kindergarten teacher does not know whether they are true or not. John often tells of disgusting scenes and details of the family life around him, and the teacher feels that he must see some of it at least. John has the flat nose and poor teeth which often appear with inherited syphilis, and the kindergarten teacher says that she is sure that that is one thing that is the matter with John. He is not well and often misses time at school because of illness. He is no larger at seven years than is Frank at five years.

During the time of John's attendance, he did the Knox and Healy puzzles. He tried the smaller picture puzzles and succeeded, but did not succeed with any of the larger puzzles. He learned five or six of the remaining letters of the alphabet which he did not know, and he learned to count backward from five to one (he could already count at least to twenty) and to give the arithmetical combinations to six. John easily followed the series given the class in the color cubes.

John has shown some interest in letters and numbers before this, and while somewhat dull and slow, is as ready as he ever will be for his first-grade work. His whole environment and training has been such that he is not likely to make a very brilliant student, for there is no background to make his school life a very emphatic part of his life.

Paul—Was successful with the formboard, slight confusion with 1 and 9. His cylinder performance was good. The memory span was five with six on five repetitions. He succeeded easily with the Healy puzzles and with the smaller picture puzzles.

Paul is six years one month old. His parents speak Polish in the home. The home is the poorest kind imaginable, dirty and squalid. The boy is beaten unmercifully by both parents, who in turn fight each other to such an extent that the neighbors consider the matter scandalous, and this in a neighborhood where such things are not uncommon. The parents do not work often enough to keep the home above destitution. Paul's health is poor, his throat and nose need attention, his teeth are decayed, his body is thin, and his head unusually large and irregularly formed. He attends the kindergarten only about two-thirds of the time because of poor health.

Paul was able to do all of the Healy and Knox tests. He had no difficulty with the smaller picture puzzles, but could not put any of the large puzzles together. He was able to put the square within a square, and the chevron together from the color cubes, but failed to make the more difficult designs. He liked to play with the material with which he was already familiar, and enjoyed looking at pictures in primers, an amusement not much in vogue among the others. He was absent the last week and did not have an opportunity to try to learn his letters. He did, however, learn to count to ten. His attention was easily distracted, and he was so tired a great deal of the time that he was most unpromising to work with. He impressed the experimenter as a boy who was not likely to succeed in the first grade, not so much because of general inability to do the work, but because of his habits, already formed, of irregular attendance, his frequent illness and his bad habits of inattention, probably more or less adventitious.

Mary—Mary did the formboard successfully, but confused five and four a number of times, placing five in the space reserved for four. She succeeded with the four-piece fort puzzle, but required twenty minutes to get it done.

Mary is a Jewish child. Her parents speak Yiddish in the home. They have a comfortable home, with plenty of good food and clothing. The house is clean, and Mary was always clean and well-cared for. She was five years five months old. Teeth and throat in Mary's case were negative. There was no distractability of attention in her case. She worked at one thing very persistently, oftentimes occupying her full time for forty-five minutes with one thing. Her distribution of attention was poor, and was the contributing element to her lack of ability to do puzzles and formboards. Mary's memory span was four, with five on two repetitions. She succeeded in learning in two weeks to do the Knox series of formboards, but it required a great deal of effort on her part. For two days she worked with the imbecile test before conquering it, but she never gave up. She was unable to make a square within a square with the color cubes, although she made a solid square and a square with two alternate colors. Even after being shown, Mary did not always succeed with the color cubes, and she never got along well with them. She liked to do the Knox puzzles, and always asked for them after half an hour's effort on something else. She did not learn to put the animal puzzles together, but was interested in anagrams, and built up words as well as did the others. The next day however, she did not remember what they were. She learned A, B, C, I and O and could pick them out from a group of other letters. She counted to ten, and could count out sums, but did not learn the combinations so that she could give them instantly.

Mary is very slow. She seems able to learn, and capable of it, in this respect differing from Rosie. She is not as slow as Rosie either, for Rosie actually moved slowly, while Mary does not. Mary has a very narrow attention. With this lack of distribution, Mary works on small things without getting a view of the whole. That was her trouble with the puzzles. It is doubtful whether Mary would do good work in a first grade because of this slowness. The children there have a limited time in which to do things, Mary requires a great deal more time than does the ordinary child in which to do things. She will not have this time given her in the first grade.

John Y.—John succeeded with the formboard, his only confusion being with No. 9. The performance was qualitatively very good. He had a memory span of four, with five on two repetitions. He could not count, but was taught to count to five. He placed the easier picture puzzles without difficulty.

John is five years three months old. His home is a wretched one, dirty and squalid. The parents are shiftless, and there are always excess men around the place whom the mother seems to entertain in her free moments. The child is abused and beaten. Fighting is common among the grown members of the family. John is fairly well nourished. He has enlarged tonsils and badly decayed teeth, but appears fairly sturdy and solid. The family speak Polish in the home, and the boy does not understand English very well, that is, he knows the common words of command in the kindergarten, but is not able to retell a story.

John shows the same persistency as that of the other Polish children. He works long and hard, and succeeds in getting what he wants if permitted to take time enough. He easily did the Knox puzzles, the Healy A and B, and the smaller and larger picture puzzles. He learned to count to ten, to count backward from five to one, and to count up his arithmetical combinations. He learned the names of half a dozen letters, A, B, C, I, O, S, and of several words, but he showed no interest in learning this sort of material, while he did like to do the puzzles, both of the formboard variety and the pictures. John will be slow with this school work. He likes to take his time in doing things, but he is capable, and has enough mental equipment to do his work. It is doubtful whether he does well in school unless he gets good training this spring, as he is not well equipped in English, and his home is not one which will give him much encouragement, but he is able to do the work.

Herman—Herman placed Nos. 9, 10, 11 and 1 over the wrong spaces in the formboard. The second time he did it correctly without teaching, but watching another child doing it. His memory span was four, five on three repetitions. He did the four-piece picture puzzle without difficulty, but could not do one with five pieces. A second trial with this was successful.

Herman is five years one month old. His people are Jews. Very little is known about them at the kindergarten, except that they are thrifty and try to keep their children well. Herman, for instance, always brings the most and best lunch to school. Herman's throat is in good condition, but his teeth are decayed to just forms, the incisors forming little more than pegs in his mouth. Herman is behind the other children in his development. He is smaller than are the others, and is quieter and more babyish in his attitude toward things. He does not understand English very well, for his parents speak Yiddish in the home, although they have learned to speak English. Herman is out a good deal, and often does not come to school for a week at a time. He was irregular during the three-week period of teaching, staying out when the weather was good. His performances were surprising. He easily did tests that many of the older children failed to do. He was able to finish the Knox and Healy tests without the slightest difficulty. He was not present when the children were tried out with the color cubes, the larger puzzles, or with words or letters. He was able to count to at least fifteen and to count out sums. This is as far as the instruction went.

Herman is young for his years, but it seems likely that with an added year in which to develop, especially when there is language training, he will be a promising first grade pupil.

Howard—Howard gave a good formboard performance. His memory span was good, five with four repetitions for six. He failed to do the Healy A the first time, but succeeded after seeing another child do it. He did the simple picture puzzles easily.

Howard is five years, six months old. His home is poor, not so much because of dirt, for it is fairly clean, but because of the very poor food which he has. Howard's face is dirtily white, and covered with eczema. The child scratches these sores until they bleed and are most unsightly. He is tired all the time, and when released from a task drops with a sigh of relief into a chair, to remain there until someone insists upon his rising. He learns easily, but will not try to do anything unless someone is right at hand to keep him going. There is no initiative. The first day he could not count, the second day he had learned to count to eight. He did the Knox tests, and some of the simpler picture puzzles. He was then taken ill, and did not appear at school again.

Howard seemed to have mental equipment enough to do first-grade work. His health is so poor, however, that it does not seem possible for him to do school work successfully unless his physical condition is much improved. He looks as if he might have tuberculosis. He is not likely to live through another year under the present conditions.

Albert—Gave a good performance with the formboard except that the rate of movement was very slow. His memory span was four, five on seven repetitions. He could count to ten forward, not backward. He slowly performed the cylinder test and Healy B. His discrimination and distribution of attention were adequate to his years, but his rate of movement very slow.

Albert is five years, two months old. The parents are hard-working folk who mean well, but who have no ability as producers. The income is always inadequate, the food poor. The parents do not drink and seem to try to provide for the children. Both work. Albert is thin and weak, his face white and old-looking. He misses a great deal of school because of illness, and was unable to attend more than half the time during the three-week period.

Albert was able to do the Healy and Knox puzzles. He learned one and one, two and two and three and one, but his retentiveness of these items was not tried out because of his absence. His attention was easily distracted, partly the result of his training at the kindergarten, and partly as a matter of self-preservation, for it was evident that any amount of work would be beyond his strength. Most of the time he was content to lie with his head on the table, or to quietly look at a book. For the reason just given, it would seem that Albert was not a promising child for first-grade work. As far as his mental equipment was concerned, there was nothing shown that would exclude him from first grade.

Joseph—Gave a good formboard and cylinder performance. His memory span is four, five on two repetitions. He could not count at all the first day, but learned to count from one to five very quickly. He did the simple picture puzzles easily.

Joseph is six years one month old. The family speak Polish in the home, and the parents know no English. There is a great deal of drinking in the home, and the reputation of the mother is bad. There are always extra men in the home when the kindergarten teacher has been there, and the stories in the neighborhood confirm the suspicions excited by this fact. There seems to be plenty of food for the boy, and his body is in good condition. His teeth are badly decayed and his tonsils very much enlarged. His tongue is thickly coated with a heavy dark-brown fur. His teacher reports that he is given liquor to drink, and the fur on the tongue suggests this. Some days Joseph showed no inclination to work, spending his time, if permitted, in idle handling of objects near him, or in gazing at some gold fish. Other days he worked steadily, and seemed much interested. He is handicapped in language, for with the exception of the vocabulary which he had learned at the kindergarten, he seemed to have no words at all. It is doubtful whether he can use as many words as he knows as commands. He did not know the songs the children sung, but was able to tell when he was chosen as a part of a game.

Joseph was able to do the Healy and Knox puzzles easily. He progressed through the series of picture puzzles, and was able to do the most complex without difficulty, but often did not wish to try to do the hard things. He never seemed to have "jazz," and it required effort to get him to try to do things. He was considerably better some days than others. Joseph was successful with the color cubes, doing all the designs but the zigzag, but was slow in taking it up, and required a great deal of encouragement, and much praising before he would attempt it at all. His rate of movement and the time required for his performance was considerably in excess of most of the others, that is, with the exception of the other Polish children, who were about as slow or slower than Joseph.

Joseph was a puzzle to everybody. Some days he did so very well, and other days so poorly. The kindergarten teacher suggested possible drinking as the cause of this, and it seems likely that this was the explanation. Joseph showed no aptitude for learning the letters or words. He responded when asked, but never initiated an answer himself. He learned two words, also to count to twelve. He was able to count out small sums, but not to an extent which would warrant one saying that his interest had been touched. Although six years of age, and a possible candidate for the first grade next September, Joseph is not a promising pupil. He seemed to be equipped with sufficient mental "goods" to do the work, but his language handicap, sufficient in itself to prevent his doing well in school, is further augmented by his home environment to make it unlikely that he will do well in the first grade.

Andrew—Andrew did the formboard well. As he was the last one to try it, he continued to play with it, repeating it several times.

Andrew's people are Polish, and speak Polish in the home. The home is clean and the people are respectable. Andrew is six years, five months old. He is losing his first teeth, and has no teeth at all on the lower left-hand side. His front incisors are missing also. The teeth which remain are badly decayed and can offer very little useful surface for the chewing of food. His tonsils are enlarged so much that they meet across the throat passage when the throat is in repose. His physical condition otherwise seems fairly good. He is well-nourished. His eyes protrude slightly and his facial expression is vacuous. His language attainment is poor, yet he knows some of the kindergarten songs, and the kindergarten teacher reports that he really understands what he is singing about, although Rosie and Joseph do not seem to, as they are unable to explain about the songs.

Andrew did very little with the tests, requiring so much time for each that he did not get far. For instance, he spent an entire period on the imbecile test, and the same for the moron. The other children would do four or five in the same time. He did not learn to count or to recognize any letters or words. An assistant tried to teach him, and also gave him the Binet test. The results showed that Andrew had a memory span of three, which was not increased to four on ten repetitions. He is nearly two years retarded on the Binet scale. The failures on this scale were significant. He was unable to copy a square, to repeat four digits or thirteen syllables as is expected in the four-year tests. He failed on the three commissions and the aesthetic comparison in the five-year tests. His attention was very easily distracted, part of which might be laid to training, and part of which undoubtedly was inherent. Attempts to teach were futile. His limited memory span and lack of retentiveness made this impossible, even if the attention had not been so bad.

In this boy's case, there is no doubt that he will fail to do first grade work. His memory span is too limited to make it possible for him to do good work. If at six and one-half years, he is as slow as he is, there is little hope that he will overcome this defect enough to make him a profitable student. His physical condition ought to be improved through the removal of his tonsils and dental care for his teeth. As it is he is a poor prospect for first grade.

MEMORY SPAN TESTS

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The memory span test consists of a presentation of series of stimuli with the immediate reproduction of the series by the subject. The stimuli may be digits, syllables, words, sentences, paragraphs, diagrams, objects; the presentation may be made auditorily, visually, articulatory, graphically or in combinations of two or more of these methods. Usually the stimuli are presented either auditorily or visually, but the subject may and in most cases does re-enforce the stimulus by repeating the elements or naming the objects, so that it is next to impossible to get a purely auditory or visual stimulation. Nor is this very desirable, because in every day life from childhood we habitually use some such methods of combining impressions, and the results obtained from these tests are more significant if the methods of apprehension and reproduction are like those ordinarily used. Memory span test was first proposed and used by Jacobs, an English philosopher, and the results were reported by him in 1887. He used digits and syllables for stimuli, but discarded the latter in favor of the digits. In this country Smedley first used the test on a considerable scale in a study of the school children in Chicago to test methods of teaching spelling. He reported his results in 1900. Since that time the test in some form or other has been used by many workers, and when Whipple published his Manual of Mental and Physical Tests in 1910 he compiled a bibliography of fifty-two monographs and articles dealing with what he calls tests of rote memory, all of which are memory span tests in some form or other.

The assumption that this test is a test of memory has marred most of the experiments, and especially the interpretations which have been put upon results obtained from them. Jacobs in proposing the test called his study, "Experiments in Prehension." We think that a definite congenital ability exists, which is measured in the performance of this test. This is the ability to distribute the attention over a series of discrete perceptions, and is shown by their immediate reproduction. In other words, it is the ability to grasp a number of different elements in one operation of attention. Perhaps "prehension" is a good word for this ability, but like so many other terms is used in other senses. We are using the term "Associability" and subsuming it under the general heading of imagination. The subject must have enough imageability to get perceptions of the stimuli, but the test does not measure imageability either as to types employed, or the extent to which they are involved in the performance. Memory is not tested. The images must be retained long enough but this process is only a sort of after image, and the period of its duration is so brief that the results do not furnish any criterion by which to judge of retentiveness. In the memory span test proper there is only one presentation of the stimulus, and this single presentation cannot be considered as teaching or training. Therefore, the only two aspects of that particular form of imagination called memory, namely, trainability and retentiveness, cannot be measured nor even estimated from the result of this test. These statements will be shown to be true from experimental data later on.

For several years we have been giving in connection with our first course in psychology, memory span tests, employing as stimuli, digits, letters, nonsense syllables, short words, sentences, paragraphs. These are presented auditorily with graphic reproduction. The results obtained in this way using digits as stimuli are presented herewith. In giving this test, series of digits are read at the rate of one per second without rhythm or grouping. The experiment is started with series of four digits, and the series are increased in length until series of twelve are reached. Two series of each length are given and the class is always informed of the different number of digits in the series about to be given. In preparing these series great care must be taken to have the digits really discrete stimuli. Reuther in "Psychologische Studien" in 1906 formulated rules for the construction of test series of digits. The most important are: "Do not place any two digits in their natural order, nor in their order reversed. Do not use sequences that suggest historical dates." These rules are violated in the Terman revision of the Binet test, and in the recently published series in the magazines, making such series worthless for testing purposes in comparison with the results of carefully prepared experiments. The students hold their pencils in their hands in a vertical position in order to avoid the tendency to make the figures in the air at least. As soon as each series is dictated the students write it as nearly as they can. In scoring the papers the number of digits in the longest series reproduced exactly as read is taken as the score. Using this method of procedure with several succeeding classes we have the following table, including results from 476 men and women.

Digits	Number of students	Per cent of whole number
5	13	5.9
6	40	8.0
7	87	13.5
8	106	22.3
9	99	20.8
10	64	18.3
11	38	8.4
12	28	2.7

Mode=8. Median=8. Mean=8.5.
70.5% score above 7 digits.

Using the same method of procedure we employ as stimuli common words of three letters arranged in series of three or more words, two series of each length. Care is taken in arranging these series so as to avoid as far as possible familiar combinations and associations. We obtain this next table including results from 360 men and women.

Words	Number of students	Per cent of whole number
3	2	0.5
4	17	4.7
5	142	39.5
6	107	29.7
7	75	20.8
8	17	4.8

Mode=5. Median=6. Mean=5.8.
55.3% score above 5 words.

We have tried different sets of sentences none of which are entirely satisfactory. Those of the Terman scale are too easy and too absurd for our students. This year we have tried a new series ranging in length from ten to fifty syllables. There are two sentences of each length, one intended to introduce a concrete visual image, the other to avoid visual imagery so far as possible. Fifty syllables are too many to get exactly. The highest number anyone reproduced correctly is forty. The sentences which avoid concrete visual imagery are reproduced correctly oftener than the others. The table includes results from ninety-one men and women.

Syllables	Number of students	Per cent of whole number
20	9	9.9
25	10	11.0
30	60	65.9
35	11	12.0
40	1	1.1

Mode=30. Median=30. Mean=29.2.
79% score more than 25.

For ideas we have also tried different material. Among others we used the well-known paragraph of the Binet series beginning "Many opinions have been given on the value of life." This is easily scored on the basis of seven fundamental ideas, and gives the following results from 135 men and women:

Ideas	Number of students	Per cent of whole number
1	1	0.7
2	3	2.2
3	13	9.7
4	31	22.9
5	30	22.2
6	31	22.9
7	26	19.2

No mode. Median=5. Mean=5.9.
87.2% score more than 3.

This shows that the test is too easy for our students, although it is included in the superior adult tests of the Terman Revision.

To complete this series of tests a real memory experiment is given consisting of a series of twenty sentences, each made up of a fact, a name, and a date. These are taught to the class by reading them over three times. After a period of forty-five minutes which is filled by a discussion of the former experiments and their relation to memory, the experimenter reads the facts, and the class writes the name and date. This experiment permits of several variations, and reproduction may be repeated at intervals to test retentiveness. In a class of eighty-nine men and women the scores range from six to thirty-six. There is no distinct mode. The median is 20, the mean is 18.6. The names are remembered better than the dates. Probably the correlation would be higher with more verbal material used instead of the dates. Comparatively little has been done with this particular investigation, but it promises very interesting results.

In studying the results of these tests to gain light on their meaning we have found the correlation between the results with the different groups and with different tests. Using Pearson's formula the following are some of the results obtained. Any value of "r" less than .30 is held to show that the same factors are not operative or in other words that different abilities are involved in the tests. Any values over .30 show some tendency or ability operative in both tests, while values over .50 are considered to be very significant.

Digits and words, r = +0.52.
Digits and sentences, r = +0.37.
Sentences and ideas, r = +0.37.
Sentences and memory, r = +0.12.

Combined scores of digits, words, sentences and ideas with the memory experiment, r = +0.09.

These correlations are a strong indication that the discrete stimuli test some different ability from any of the other kinds of material; that this ability is not memory; that a person may be deficient in one ability and have enough of some other to make some compensation. We have found in our work with children that deficient associability usually is accompanied by difficulty in learning. Children who are advanced in school (under age for grade) have longer memory spans than those at age for grade, and they again longer than those over age for grade. This test taken in connection with a performance test is likely to be the most significant of all the tests we employ for diagnosis.

DEBIT OR CREDIT

By Gladys G. Ide, Ph.D.,

Social Service Department, Psychological Clinic, University of Pennsylvania.

Reports of the investigations of the progeny of persons who are classically termed feeble-minded have dealt only with those members who had become wards of the state or who were in some way a menace to the social community of which they formed a part. The implication is that the family produces nothing but members of the non-social group. The drab farmer-folk and the slow, plodding laborer with their dull, stupid wives fail to catch the eye of the investigator, even though their children may rise little by little to the mediocrity of the majority, and the mortgages be lifted from the tiny strips of land and the homely little town houses. In a word, there is a distinct upward trend in some branches of the family to counterbalance the tendency to sink in the social scale shown by others.

The M—n family was founded near one of the flourishing cities of the state of Pennsylvania. The father was a staid, stupid sort of man, a good worker and without bad habits. To be sure he possessed no consuming ambition to achieve eminence, but he was always able to keep his head above water and to supply his family with the necessities of life. The mother was fifteen when she was married. She bore seventeen children, the first twelve of whom lived and thrived. The last five died in early infancy, the victims, it would seem, of tired maternity.

It need hardly be said that the children were not of the best in the town. Youngsters whose bare legs are conspicuous not only through the summer but also into the fall after bare legs are no longer considered a luxury, whose frocks and trousers are obviously hand-me-down, unpatched and too often unwashed, whose hair and hands show the effects of prolonged attacks of the weather, such youngsters are not usually considered the future bulwarks of a community. Day school and Sunday school alike were pretty much unknown to the tribe, and habits of "swiping" and swearing did not endear them to the mothers of more hopeful sons and daughters. Maturing early, marriage with others of the same ilk as themselves was to be expected.

Two of the children, the oldest daughter and the youngest son remained single. The son continued in the father's footsteps, becoming a replica of the father in appearance and habit, good, hard-working and non-assertive, satisfied with his pipe, frugal and selfdenying. The sister with whom he lived was of the same stripe. Together they bought the old family home, the sister furnishing her share by earnings from ill-paid service at dressmaking. The town accepts this pair, shrugs its shoulders and remarks, "Very good, for a M—n!"

The remaining members of the family with one exception live within a few miles of the elder sister. The youngest child, a girl, married a carpenter, a man from her own group. Neither are able to read or write for useful purpose, but the man is competent and the woman ambitious. She urged their removal to a more distant city where they now own a very pleasant little house, well-furnished. Church affiliations were made and earnest efforts on the part of both parents inspire two boys of school age to stand at the head of their classes. These children are bright little fellows whose teachers speak well of them, both from the standpoint of their ability in school work and also from their behavior. This family together with that of another one of the girls, likewise ambitious and keen, stands at the head of the family group as its most capable members. The second family also is pushing its children through school, is investing in the securities of the United States so popular this past year and is making plans for those affiliations which will mean wholesome social life for their children later on. The home is theirs, the children neat, clean and responsive and the atmosphere one of peace and contentment. It is unnecessary to add that these two families are not on calling terms with relatives.

The second group consists of four families, self-supporting but not constructive. They make their own living, but should difficulties come they might soon slip below the poverty line. The children attend school at distant intervals when required by too-zealous attendance officers. The boys are sallow-faced, sneering chaps from whose loose lips hangs the inevitable cigarette and who slouch on the street corner to sport their cheap jokes on the passer-by. The girls are gay and flip young birds, addicted to gum, make-up and the movies. All try to work, but find it necessary to change employers frequently as they come to a job poorly prepared both in education and inclination. There have been one or two who have passed time under the guardianship of the state, and there are others of whom the townspeople unfortunate enough to be neighbors shake solemn heads and ask, "What could you expect? They are M—n's."

The third group of families, of whom there are four, have been careless about marriage rites. Children are unable to trace their paternal ancestry with needed accuracy. The homes are badly furnished and very badly kept. All are fond of the convivial cup, and the lonely farms have been scenes of orgies impossible to describe. The children of these families attend school but occasionally— illness, lack of food and clothing being frequently the cause of the delinquency in this respect. Eight cases of feeble-mindedness have been found among the children, not one-half of whom have been before a psychologist. One adult and two adolescent members of these families are now in hospitals for the insane in the state, and other adolescents have failed in their efforts to pit their wits against the vigilance of the law. Misery, poverty, dirt and squalor have been the portion of those remaining at home.

In one of the latter cases, a M—n boy married the daughter of a neighbor, and his sister took the same step with the neighbor's son. On one side the children, five in number, have been either insane or feebleminded, on the other, the two daughters are making their way in the world, one as the widow of a young soldier with an infant still in its first year as a dependent.

Thus the community stands to profit by the efforts of the members of this family who place themselves among the more conventional-minded representatives of their group, who keep their children in school and who make of them valuable material for the community, fit for the responsibilities which shall come to them. The families, who must struggle to maintain themselves at the normal level, still recognize their own value as compared with those of the lowest group, for they refuse to have social relations with them and continue to maintain a sort of aloofness encouraging in its expression of self-respect. Only those of the lowest group promise, in part at least, to place themselves on the debit side of the community ledger.

INTELLIGENCE AND EFFICIENCY TESTS DISTINGUISHED

By A. L. Ide, Ph. D.

University of Pennsylvania.

The man who has had no experience or acquaintance with psychological tests is very apt to form the judgment that all tests of this variety have emanated from a hospital for the insane. A closer view of the form and subject matter of the tests may lead to a modification of his judgment. He will still maintain that most of the tests have been prepared by the inmates of the hospital, but he will admit that perhaps some of them have been produced by the keepers and attendants. The basis for the differentiation into the two groups is the apparent fact that while some of the tests show intelligence to some degree, the rest of them show that intelligence sadly gone astray. If we should examine the two classes of tests after the man on the street had divided them into the two groups, we should find that he had unconsciously divided them roughly into tests of efficiency, and tests of intelligence.

For it is the purpose of testing in general to answer either or both of two questions: What are the fundamental capacities of the individual in question, and how much has the individual acquired as a result of his contact with his environment? It is the group of tests prepared for the purpose of answering the second question that seem to be moderately sane. Their reasonableness arises in part from the fact that we are generally familiar with tests of that kind. If we change the name and call them examinations, we shall find ourselves on very familiar ground. From the beginning of school life on up to the end of it, we find the student exposed to a particular controlled environment, which is his instruction in class and the prescribed studying which he presumably does. At the end of the course a test, or examination, is given to see how much has been acquired during the progress of the course. Such an examination would be classified among the efficiency tests. It is not given to determine what the capacity or innate ability of the student may be, but merely to find out how much has been acquired. Two students of very different real ability may have acquired approximately the same amount from the course, the weaker one having put in a proportionately greater amount of time and labor. This acquirement may be in the form of a body of remembered knowledge, or a degree of manual or mental dexterity, but it is always something acquired.

While examinations fall in the class of efficiency tests it must not be too readily admitted that they are at all scientific as tests of that kind. The best that any examination can do is to put through a sampling process of greater or less exhaustiveness. If it were possible to give a student as an examination a test which would require the reproduction of the entire course, then the results of the examination would be an exact measure, at the time, of the amount acquired by the learner. But the examination at the very best can merely call for material taken at random from various parts of the course. It depends very largely upon the ability and industry of the examiner whether the samples taken are representative of the course, and whether the weight given each sample as its share of the entire score is commensurate with the difficulty of the question itself. But while examinations are often very faulty in these respects, it is so seldom that the fate of the subject rests entirely upon the examination that in the long run very little harm is done.

It is because of this lack of scientific accuracy and standardization in examinations that efficiency tests have sprung up to fill the need. This can best be made clear by referring to one of the best known and most popular of efficiency tests, the Courtis tests, particularly those in the fundamentals of arithmetic. The Courtis tests were evolved with the purpose of making it possible to compare the elementary work of various schools by means of some just and fixed standard. In the field of arithmetic it was simply done. In series A of the set of tests Mr. Courtis prepared a page of additions in which single figures were added to single figures. The score was the number of such additions which could be accomplished in one minute of time. The same form was followed in multiplication. In subtraction there was a slight modification, as the minuend sometimes contained two figures instead of one. In division the dividend was usually two figures, the divisor one, and the divisions always came out without a remainder. There was a fifth page on which the subject was given the task of copying single figures, to determine the speed of putting down figures when the operation did not involve any mathematical calculation.

The whole arrangement seems very simple and at first glance one does not see how it is any advance over what second and third grade teachers have been doing for many years. The main value of the test lies in the fact that it has been nationally standardized. It has been given to students in schools in nearly every state in the Union, and the results from many thousands of school children of all grades and ages have been combined to secure normal scores. With these normal scores available it is possible, and convenient, for any administrator to give the tests in his school and at once be able to compare his results with the standard results from the nation as a whole.

In one respect the Courtis tests have become somewhat unfair as a means of comparison of work. The standard scores are being constantly brought up to date by the addition of the more recent results where the tests have been used. To induce administrators to submit the results from their schools Mr. Courtis makes a substantial discount in the price of the material to those who do send in the scores obtained. Where these tests are used, and further use anticipated, teachers and principals become ambitious for better results, and an excess of effort is expended in teaching especially that department of arithmetic. In fact, Mr. Courtis publishes a set of practice cards to further this very thing. As a result many of the scores which are incorporated with these of previous years to obtain revised standards are from schools which have made a specialty of this thing. The standard scores therefore steadily become higher. The superintendent of a school which has not been vigorously drilling is usually greatly disappointed when he first gives the test in his school.

Mr. Courtis has since published series B in the fundamentals of arithmetic, in which all the processes are longer and more complicated. Whether they represent an improvement over the first series produced is still a matter of opinion.

It can readily be seen that the Courtis tests in the fundamentals of arithmetic are purely a test of acquirement, an efficiency test. This is shown by evidence of various kinds. Two students of widely different degrees of innate ability may get the same scores in the addition test, merely because one has had more or better training than the other. Also, any student may progress from one score in the test to a much higher score in a later attempt by putting in the requisite amount of study and practice.

This is not the case with the other general class of tests, the intelligence test. In this form of investigation, the attempt is made to determine the innate abilities of the subject, regardless of the formal teaching he may have had, or the good or poor fortune of his environment. It is the attempt to eliminate the effect of training and experience which makes these tests appear as if they had been produced in the wandering minds of the inmates of a hospital for the insane. It seems reasonable to be tested to see what we can do by special endeavor and practice, but to be tested for what we can do in a game in which we cannot improve our work by practice, falls outside the reasonable experience of the individual.

An illustration of this style of test is the one which rightly or wrongly goes by the name of the memory span test. In this test, a series of digits is read slowly to the subject, and he is required to reproduce the digits in the same order at the close of the presentation. The score is the largest number of digits he can successfully reproduce at one time. It may or may not be a measure of one's memory. But the important thing to be noticed about the test is that no amount of training is able to bring about any significant increase in the score which the individual can obtain. It may vary with fatigue, with illness, with age, but seems to have nothing to do with training.

Another test of this same variety is found in the various forms of the cancellation test. A common one is the Columbia A test. In this there is a page of capital letters, printed in random order, and one out of every five, but not every fifth one, is a capital A. The score is the number of capital A's which the subject can cancel in a minute of time. Here again, no amount of training with a set of the tests seems to bring about any improvement in the work of the subject. The various directions tests are all contrived with the same end in view. The subject is given certain standardized directions, in following which he is to accomplish tasks for which he has made no immediate preparation. If the tests have been well contrived, any two people of the same degree and type of intelligence would be able to obtain approximately the same score, regardless of the formal education which they had received, or of the good or poor opportunities represented by their several environments.

This then is the basic difference between the two classes of tests, whether they are calculated to test ability independently of training received, or whether they are testing the degree of the accomplishment resulting from training. There are other aspects in which the two forms of tests usually differ.

Since the efficiency test is not attempting to analyze the individual's condition, but his progress, it is almost never an attempt to get a measurement of any single mental factor or faculty. There is no aim to differentiate between visual memory and auditory memory, but merely to find out how much has been remembered. The examiner is not attempting to find out whether the imagination is largely motor or largely tactile, but rather to see what the subject has accomplished, or can accomplish by means of the imagination. Any number of different mental powers may be put in use in accomplishing a specific addition or subtraction of numbers. In the efficiency test we measure the accomplishment that results from the total combination of the powers, not differentiating one from the other. The efficiency test is not at all at fault for failing to make this distinction in its results, because this distinction is of no advantage to the purpose of the test. On the other hand the tests are much simpler than the intelligence tests, for the very reason that they are not required to distinguish one mental power from another.

But the measurement of particular and distinct mental powers is the chief and sole aim of the intelligence test. Very little has been accomplished in the diagnosis of the mentality of the individual if as the result of a test or a series of tests we can get only a score which represents the measurement of a complex of powers. It is necessary to analyze and measure by every means which ingenuity can invent in order to find and evaluate the various contributions to the total intelligence which the various mental powers present. It is again this attempt to get down to the fundamental, the unitary, which gives to intelligence tests the strangeness of appearance that arouses amusement in the minds of the inexperienced.

This situation throws some light upon the question which is arousing so much interest today, that of employing psychological tests as a means of determining the fitness of a candidate for entrance into the University. Examinations for admission hitherto, have been pretty largely tests of accomplishment. They strove to answer the question—has the candidate learned enough so that he may go on with the content which the University courses offer him? The new attitude might lead to the imposing of intelligence tests to determine whether the candidate is of that capacity of mind which warrants him to undertake the work of the University. Since tests calculated to lead to the answer to the second question are necessarily of unusual character, strange to the mind of many, it is unlikely that the proposition of using them will grow rapidly in popular favor.

In the previous pages the assumption seems to have been made that the two forms of tests are distinct. In practical operation this is not the case. Each depends upon the other. In the efficiency test, the test of accomplishment, the test of intelligence is invariably involved. For an instance of this we may use again the Courtis fundamentals test. When I learn how rapidly an individual has learned to add figures, I have a measure of a complex of mental attainments, which includes many factors which are not attainments at all. There is the varying reaction time, the varying memory span, the varying attention span, the fundamental difference in speed of movement as distinguished from the speed of initiating movement, and many other factors. Variation in these factors will of course modify the final score of the individual, but as I have suggested above, the efficiency test is not concerned with the factors which have brought about the results, but with the complex of the results themselves.

The intelligence test, in its turn, almost always requires a certain amount of acquirement. In the Columbia cancellation test, the subject must learn, or have learned, the differences between the letters, in order to take the test at all. In the memory span experiment, the person tested must know the various digits. But if the amount of acquirement assumed is easily within the experience of the one tested, it causes no variation in the result. If a test were so selected that the individual should grade low because there were factors in it which he had not yet learned, it would be open to considerable criticism. This would be the case if I should attempt to measure the memory span of the ordinary twelve year old boy and give him the digits in Greek.

To sum up, we find that tests divide at once into two classes, those of capacity, and those of accomplishment. The latter are familiar and reasonable, the former unfamiliar and at first unreasonable. The intelligence test attempts to measure mental unitary powers, the efficiency test to measure the results of combined powers. The intelligence test tries to make itself independent of the acquirement test, and succeeds only in part, while the acquirement test always includes the intelligence as a part of the complex which it measures.

SOMETIME LATER.

A FOLLOW-UP OF TWO CLINIC CASES.

By Gladys G. Ide, Ph.D.,
University of Pennsylvania.

ALAN

The dapper young officer had just arrived on leave from an aviation camp. His lieutenant's bars and aviator's wings, together with the wonderful slenderness of his figure drew the attention and eyes of every woman in sight as he left the station in the wake of relatives and friends, after having, with suitable military bearing and with exact military courtesy bestowed a greeting on those meeting him. His mother gazed on him with glowing eye, his father, lazily tipsy, admitted him into the inner circle of manhood with a wink, and his elderly friend, a social worker and former counselor of the family, met him with a steady pressure on the palm, rejoicing that her wee lamb had grown to such lofty proportions and had come out so well.

At home, with a story to be told, the family learned by degrees of the wonders which had come to the boy. Of scarcely twenty summers, he had enlisted at the first call—that of a marine officer with the word "slacker" on his lips. With five thousand others he was herded to a Texas camp, where he was chosen one among ninety to form a crack squadron to train for aviation. The second training camp in Ohio was the scene of triumph after triumph to the boy as he rose first to corporal, then to sergeant and finally after some months to the bars of the sub-lieutenant. He had been trained also in actual flying with Captain Vernon Castle as instructor. In trying to establish a high altitude record, he had remained aloft some hours at a height of eight thousand feet. The tail-spin, the loop-the-loop and the falling-leaf had no terrors for him, and he laughed at the foolish fears of the women when he described the sensations which had been his in several trying experiences. The youthful aviators vied with each other in their attempts at daredevil flying, and it was the proud boast of our hero that he had been able to "nick" the roof of the airdrome with is machine in descending, thereby calling down on his head the encomiums of his young friends.

A short time after the visit of the spick-and-span officer had been concluded, the middle-aged friend of the family had opportunity to request a captain, who was ordered to inspect aviation fields, to call upon her young friend. The captain made his visit, and like the good officer that he was he returned to make a report of what he had discovered. Instead of a lieutenant he found a private, instead of an aviator he found a very poor mechanics' helper, so poor that his sergeant had completely lost his vocabulary in trying to teach him to be useful in some way to the camp, instead of cleanliness and order so dear to the lad at home, he found a boy who committed all the crimes on the military calendar in the way of being disorderly and disrespectful. In short, he found a private of whom no good in the way of report from either officers or men could be said and for whom an exchange was desired. At about the same time a letter came from the boy deploring his lack of education and stating that he was the only man in the outfit who had never been to college. He spoke of the expense necessary to keep up the position of lieutenant and ended his plaint with the request for fifty dollars.

The wee lamb had grown into a sheep, but the color of the coat still remained, if not of sable hue, at least a somewhat dull and dingy gray. This might have been predicted when, five years before, the boy had been brought to the Psychological Clinic for mental diagnosis because of backwardness in school and a general ability to get into trouble and a subsequent inability to get out of it. On examination he did very well in mechanical tests where the skill required was largely manual and the mental elements involved were those whose development come early in life. He possessed a limited vocabulary and a narrow memory span, but his retentive memory was good, and material which could be learned by rote he secured easily. He was not able to work out problems for himself either at the laboratory or at school where he was able to keep up with his class in the seventh grade in every subject except arithmetic. He had only fair imageability, and his imagination was not that of the normal adolescent boy but more like that to be expected from a nine or ten-year old. In short, his performances indicated that he was equipped with the sort of ability which is needed in routine work, an ability which is ample to provide a livelihood in factory or shop, but which is never able to clearly imagine processes or results. His behavior indicated this also, for he was always caught in any misdemeanor, however small. He never could manage to cover his tracks or arrange for an alibi as most children do. More serious difficulties in the city easily involved him with the police, for no matter how many of his gang escaped, he never did. The present instance of impersonation of an officer was a case in kind, for he made no effort to avoid discovery and apparently had never thought of the possibility of any one's finding him out. That he was not reported was due to the kindness of friends and not to any cleverness of his own. The diagnosis in his case was that of normal mentality with the reservation that his environment would need to remain simple or his lack of ability to foresee consequences would sooner or later result in entanglements with the law.

MARY.

A rosy-cheeked, snub-nosed little girl sat at the kindergarten table ready to show the psychologist what she could do. Giggling excitedly, she reached for the blocks in the formboard almost before it had left the examiner's hands. Hurriedly she tried a four-sided figure in a three-sided space, paused a moment, and then pushing valiantly, attempted to force it into place, meantime glancing inattentively around the room. Gasping and struggling, she finally placed the blocks, a foolish little giggle finishing the performance. A second trial called forth as great effort. The third trial was successful.

Mary was just six—a brown-haired, blue-eyed little maiden with regular teeth and velvety skin. Perhaps the head was a bit small, but the sturdy body gave no hint that all was not as it should be.

With hurried movements, Mary continued the business of the day. She tried other mechanical tests to her discomforture. She could not match the colors shown on the faces of four blocks placed together to form a square. With breath restrained and deep gurgling noises, she made her squares, but failed to notice the position of the colors in her copy.

Unheedingly, she followed the words of the examiner with immediate responses, too impatient to listen to directions. Only by the utmost effort did she restrain herself when four digits were said to her for her to repeat. Her age was a matter foreign to her, color names were meaningless and counting an impossiblilty. The day of the week, the number of her sisters and details of family life were as unknown to her as to the heathen Chinese.

Mary's family found her hard to live with. While she possessed cleanly habits and could be useful around the home, her methods of play were difficult for other children to endure. The ways of the far-famed "wild man" are effeminate compared with those of Mary when she played with other children.

As an infant, Mary was different from other children, as her food did not agree with her and she developed a bad case of marasmus. Before Mary's arrival, her mother still suffered the afterffeects of typhoid-pneumonia. Nevertheless, at one and a half years, Mary was walking and talking.

Mary's manner, attitude and slow response suggested the mental defective. She showed marked retardation both in the way she did things and in the kind of things she could do. Other-children feared her and she was not able to take her place with them as a peer. In every respect, she was distinctly younger in mental development than her years led the examiner to expect. He returned a diagnosis of Low Grade Imbecile based on Barr's Classification, because of the marked retardation, and of moral imbecility because of the social incompetence.

Eighteen months later the same examiner had presented to him another little girl. Truly another little girl although the name borne by the two was the same. The same well-built little body, well-nourished and strong, the same eyes and teeth and the same creamy skin, all changed in appearance by the absence of the silly, babyish giggle, the quick indrawn breath, the nervous movement. Mary had been to school. She had learned to get along with others well enough to stay there. She had been no star in her studies, and belonged, like Emmy Lou, at the bottom of the class, but she had passed. She still had tantrums, when she bit and kicked and struck the other children, but she had been possible to live with and her "spells" occurred at longer and longer intervals.

Clinic tasks were performed easily and as quickly as was to be expected from a child of her years. She matched her colors and made designs in record time and counted correctly to 16. Many of the questions in the Binet tests were quite outside the realm of her training, but, even so, she succeeded in scoring a mental age twenty-two months less than her chronological age, the failures occurring on such questions as the days of the week, the names of the months, the names of coins, or on attention span which still remained low. She appeared retarded, but of normal mentality notwithstanding the earlier diagnosis.

Six months later the attention span had become five digits and marked improvement was noted in the speed with which she attacked mechanical tests. She worked well in the home, but failed to enjoy school. A possible reason for this may have been the frequent headaches which suggested eye strain. Otherwise her physical condition continued excellent. She could and did do passing work in school subjects and there seemed no reason for expecting her to do other than make the usual promotions.

Why this gain from seeming imbecility to dull normality? Who can say? Beyond the care usual to children of middle class parents, she had nothing in the way of mental or physical stimulation which would account for the greater mental activity. Her home was neither better nor worse and other environment remained the same. Nature seemed to be taking a hand in the game, providing in some way for the increased activity which manifested itself so prominently in the improved behavior.

A STUDENT'S REPORT OF A CLINICAL EXAMINATION.

By Helen R. Squier,
Graduate Student, University of Pennsylvania.

[In the course in Clinical Psychology at the University of Pennsylvania, a class composed of graduate and undergraduate students in the School of Education, the students are required to observe and make note of the examination of children brought before the class for that purpose. In the final examination of this class at the end of the first term of the present year the class was required to observe and record their observations on the performance of a child, who was examined by an advanced graduate student in Clinical Methods under the direction of the instructor. Each member of the class was required, as a part of the examination, to hand in a paper which should include notes on the clinical examination, an analytical diagnosis, a final diagnosis and recommendation.

The case was interesting and difficult of diagnosis because of the conflicting results of the different tests. The diagnosis recorded as given by the clinical psychologist was: "Retardation on the anatomical scale, four years; on the pedagogical scale, five years; on mental age score, six years. Quantitatively feeble-minded. Considering the family history and mechanical tests will probably be above the line of social competency." It was recommended that the boy be taken from school and put to work. The diagnosis and recommendation were not known to the class until after their papers had been handed in.

The following paper was submitted by Miss Helen R. Squier, B.S. in Ed., a graduate student in Psychology, and is reproduced here as it was handed in without emendation.][1]

Physical Characteristics.

C. is decidedly small for his age, which was fifteen years, but, aside from this, he has no noticeably abnormal bodily characteristics. His head, however, was quite suggestive. Though it was not measured, I believe its circumference must have been a little smaller than the average normal head circumference of 22 inches, and there seemed to be a slight depression of the occipital lobe. He has a very high arch in the roof of his mouth, his lower jaw is short, his upper jaw extended. The high arch and the bad mouth formation in general are not necessarily signs of mental deficiency, but they are found more frequently in feeble-minded children than in normal children.

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[1] Dr. H. J. Humpstone was the instructor of the class and the clinical psychologist responsible for the examination and diagnosis.—L. W., *Editor.*

Analytical Discussion.

1. The Mechanical Tests.

It was evident from the first effort he made with the form board that he was capable of passing this particular test. He worked with good plan, and showed a contracted particularization and a distribution of attention that were quite sufficient for the test. He was successful in his first trial in 18 seconds. In the second trial, he picked up several blocks at once, and worked from the bottom of the pile in his hand to the top, showing that he had a clear conception of the problem before him, and that the form board space perception is quite within the range of his abilities. When, in the third trial, he was asked to take the blocks out for himself, he made such good use of his opportunity that he was successful in 13 seconds, in spite of the fact that his movements were still rather slow. In fact, the slowness of his movements suggested to me a lack of interest—a feeling that he need not put forth his whole effort to satisfy the demands of the examiner, and this suggestion was supported by the evidence of the other mechanical tests.

In his first attempt at the cylinder test, he still worked rather slowly, using the right hand only. His first block was wrong, but he corrected this when he found the block that really belonged in the hole in which he had placed this first cylinder block. At last, at the end of 72 seconds, the cylinders were all right except two, and he quickly corrected these two at suggestion. It was evident that he felt that this test demanded more of him than the form board had done, for, in the second trial, he worked a little more quickly, though he continued to use only one hand. His space perception seemed quite adequate for his task, and he was quite accurate in gaging the comparative size of the holes and the cylinders. His plan was to stick to one cylinder till he found the right hole for it. He was successful with no errors this time in 46 seconds, proving that he had profited decidedly by his first attempt. In the third trial, he used both hands, and moved more quickly than he had formerly, but he "worked" only one side of the board at a time. He showed, however, that he comprehended the plan on which the board was built, and was successful in 36 seconds. This record is quite as good as some college records.

He built his chevrons by individual blocks, rather than by an observation of the whole effect, and showed a better contracted particularization than a distribution of attention. When he was working with the double chevron, he worked along long rows, instead of completing one chevron and then trying to go on with the next, as most children do. The result was that he ended with all his blocks in one long row, though their relation to each other was correct except for this. He corrected his mistake a block at a time, with less single block analysis, and a greater eye for the general effect. The whole test, however, showed that he worked by consideration of details as such rather than by trying to get the general effect. He was successful in the first transfer on blocks after he had made the double chevron, but in the second attempt at transfer he forgot the method and movements of the examiner, hesitated, and failed. He easily remade the design he copied from the blocks of the examiner, however, and was successful at his third attempt at change.

It took him 2 minutes and 16 seconds to do Healy A for the first time, but he worked steadily and was evidently putting all the energy at his command into the task before him. On the second trial he shortened the time to 29 seconds, and on the third, to 4 seconds, thus showing a large degree of trainability in connection with mechanical performances and concrete objects. I think that the second trial indicated a comprehension of method, and the third, the fact that he had remembered either the movements involved or the final appearance of the completed test—probably a combination of both.

It would almost seem as if he had made use of his experience with Healy A in his performance with Healy B, though his surprising success with Healy B in 26 seconds may have been due more to good luck than good management. The fact, however, that he fitted the oblong-circle combination together and placed them in their proper positions in the test at the same time showed that he had an immediate comprehension of the nature of the test. He was successful on the second trial in 22 seconds and made very few mistakes.

His performance of Healy B, together with the Healy Completion Test, showed at least some degree of visual imagination, though the fact that he failed to imagine hands on a watch interchanged suggests that his visual imagination is limited. However, his ability to tell time would have to be tested before his failure with this watch test could be properly analysed and explained.

2. The Binet Series.

There is a peculiar lack of correlation between C.'s memory span for digits, which is 7, his inability to repeat more than 3 digits backward, and his inability to repeat correctly simple sentences of 18 syllables, which Stanford revision of the Binet Tests places at the 6-year level. The seven digit memory span suggests an adequate range of distribution of attention and a good power of association. The inability to repeat numbers in reverse order, however, combined with the fact that C. always had the correct numbers in his repetitions suggests a serious flaw in this associability, and may indicate one of the causes of C.'s lack of success in school work. The mere possession of facts which we are unable to manipulate at will does not get us very far.

I believe that children are able to reproduce sentences as much through a comprehension of their meaning and a revocalization of that meaning as by the auditory memory of certain words and syllables. If the child comprehends a word or a series of words easily, it makes no difference whether that series of words contains ten syllables or sixteen—he will be able to reproduce it with equal facility. Two such sentences as: "It is nearly half-past one, the house is very quiet, and the cat has gone to sleep," and "The apple tree makes a cool, pleasant shade on the ground where the children are playing," are by no means equal in difficulty to the same child, though they have about an equal number of syllables. The first of these sentences contains three ideas or elements, while the second contains but one. The elements in the first sentence are very simple, however, and clothed in exactly the language that would come most naturally to the child who had comprehended and *imaged* the ideas involved. The one element in the second sentence, however, is more detailed and complex than is any one of the elements in the first sentence, and is therefore more difficult than are the three elements combined in the first sentence. The first sentence tests the ability of the child to comprehend and associate intelligently and usefully. The second tends more to test the ability of the child to hold in his mind several details at once, without the necessity of reproducing them in anything but the form in which he heard them. That, perhaps, may be the explanation of why C. failed to repeat the first sentence correctly, and succeeded in repeating the second sentence. He could not visualize or image in any other way three ideas at the same time, though he was capable of reproducing a more complicated series of words involving only one picture or idea. This theory would explain the seven digit memory span and the three digit reverse. Had the retentiveness of his memory been tested in some way, the whole series of tests might have enabled us to make a very accurate analysis of his mental abilities.

The idea that his trouble lies in defective control of an adequate associability, combined with an inability to form images readily and accurately hooks up with the rest of his performance of the Binet Tests. His reading was, of course, below par for a boy of his age, since he read at the approximate rate of 2 words per second, and made 5 errors. It was the reproduction of what he read, however, that was especially interesting. Technically, it was a failure. He could not reproduce the passage with the required precision without suggestion. But the questions of the examiner revealed the fact that the knowledge of the meaning of the passage was there in decidedly larger quantity than the performance of the boy would have indicated. Here again we have the impression of an adequate memory span, with a bad control of association.

When he was asked to make a sentence containing three stated words, he was able to make a sentence that made sense, but there were only two of the three required words in it. This was true of each of the first two trials of sentence construction, though he corrected the second of the sentences at the suggestion of the examiner. His failure to make rhymes suggests very clearly his lack of what we might almost call *voluntary* associability, as distinguished from that uncontrolled associability that is suggested by the memory span of the subject.

His success with the discrimination of likeness between objects suggests, perhaps, his mechanical tendency. He notices, for example, that apples and peaches grow on trees, rather than that they are fruits or good to eat. He observes that iron and silver are both found in dirt, rather than that they are both simply metals; and that a ship and an automobile both have machinery, rather than that they both can go without being pulled, or that they are both to ride in. He can see no way in which a book, a teacher, and a newspaper are alike, but he observes that a rose, a potato, and a tree all grow. There was nothing in the mechanism or structure of the book and teacher and newspaper that suggested any resemblance to him.

His whole Binet examination indicates a failure in observation and interpretation of the abstract that is so characteristic of people with so-called "low intellectual ability." He does not know what to do before undertaking something very important, or why you should judge people by their actions rather than by their words, because these questions are too abstract for his comprehension. He knows what to do when he has accidentally broken something that belongs to someone else, because that situation is more concrete than the other two I have mentioned. His comprehension of *pity* and *charity* are most concrete. His definition involves no generalization, but an account of a concrete thing in his experience.

Diagnosis and Prognosis.

Quantitatively, the boy is of course feeble-minded. If the Binet tests can really give an intellectual level, or an age level, he is 6 years retarded, so that he is not higher than a middle grade imbecile. His I. Q. is about 61, when it should be at least 80 or 85 if he is to be considered as belonging possibly to the normal class of children. Qualitatively, however, so many questions arise that a diagnosis of this boy becomes peculiarly difficult. If we were to take the mechanical point of view, we might almost be justified in saying that the boy is normal, with a tendency toward congenital illiteracy. If we were to take the intellectual, abstract side, we would most certainly say that he is feeble-minded, with a possible mechanical bent or ability. The thing that must be of the greatest assistance in deciding the question is his social proficiency, and neither the clinical examination nor his history, so far as it could be given to us, gave very much clue to this. If he has no more ability to conform socially than his "comprehension" tests would indicate, he is most certainly mentally deficient; but his failure in connection with these may be a failure in expression, rather than knowledge.

The prognosis in connection with the case depends a great deal upon his environment. I have not had enough experience as yet to know whether or not training could even in part eradicate the serious defects in his "voluntary association;" but even if this could have been done several years ago, it is probably too late for it now, and it is probable that his environment will always be such that he will be injured rather than benefited by it. If he had a relative or a public-spirited friend with a garage or other machinery repair shop, he could be apprenticed to him and be self-supporting, even outside of an institution. He seems to have enough mechanical intelligence to copy a machine, or to learn to adjust and repair machinery along lines that he could easily be taught. He could never produce a machine from printed directions, and he could never invent a new machine or suggest an improvement on an old one. But he could be made useful around an automobile shop, with adequate supervision.

At all events, it is quite clear that he is not getting very much out of his school life. It would probably be better for him and the school both if he could be given a domestic or working certificate, and found some such job as the one outlined above.

A COMPARISON OF TEST RATINGS AND COLLEGE GRADES.

By Frank H. Reiter, Ph.D.,
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For several years the students in Psychology 1, at the University of Pennsylvania have been subjected to a series of tests as a part of their regular laboratory work. The results obtained from one of these classes have been used for this comparative study of test ratings and college grades. Two of these tests—The Witmer Formboard and the Witmer Cylinder Test—are performance tests, that is, the subjects are required to place into their respective recesses a certain number of inserts as quickly as possible. No specific intellectual training is necessary for the performance of these tests. A comprehension of very simple language will answer all requirements. Signs even may be used to get a subject to understand what is desired. The method for giving the formboard test standardized by Dr. H. H. Young[1] was employed, and for the cylinder test the method differed only slightly from the standard method later adopted by Dr. F. C. Paschal.[2] Each subject performed the test in a small booth with only an experimenter and a recorder present. In each of these tests three trials were given and the shortest trial was used as indicative of formboard and cylinder ability. A stop-watch was used to determine the time for each trial.

In presenting the formboard test to the subject for the first trial, the blocks are removed and placed at random into the tray attached to the edge opposite the subject. While this is being done the subject is told that he is to put these blocks back where they belong as quickly as possible, using either one or both hands. For the second trial the blocks are placed into the tray, piled up in a definite order. The subject's attention is called to this arrangement, and he is requested to attempt to put them back more quickly than he did before. For the third trial the subject is permitted to arrange the blocks for himself. If he avails himself of the opportunity given him here: to arrange the inserts so that they will be placed as closely to their respective recesses as possible, he will be able to perform the test more quickly on this trial than on the other two. The arranging of the blocks in a definite order before the second trial should be enough of a suggestion for an adult to follow on the third trial, even if his own resourcefulness to do so might fail him. The third trial is, therefore, the most interesting one to observe.

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[1] Young, H. H.: The Witmer Formboard. Psychological Clinic, X, 4 (June, 1916). Pp. 93 to 111.

[2] Paschal, F. C.: The Witmer Cylinder Test. The Hershey Press, 1918. Pp. 54.

For an adult the formboard is a test of motor-control or accuracy of movement; rapidity of movement, which is dependent upon the normal rate of discharge of energy for a particular subject; interest; planfulness or resourcefulness, on the third trial. A comparison of the three trials gives some indication of the subject's learning ability, but the quality of the performance must be taken into acount as well as the time required to perform the test. These two aspects involved in the performance of a test of this type are, nevertheless, related; and a relatively short trial must be qualitatively a good one even if we make an allowance for individual differences in reaction time. For 90 per cent of the subjects in this study, the third trial is the shortest.

In the Cylinder Test the inserts are all of the same shape but vary in size. They are divided into three groups with reference to variation in size: first, seven blocks are of the same height but vary in diameter; second, seven of them vary in height but are of constant diameter; third, seven of them vary in both height and diameter. The recesses for the respective inserts of each group form an ascending or, if you wish, a descending series. There are eighteen inserts and recesses. However, three inserts are represented in each group or series, *i. e.*, the three series overlap. Thus three of the blocks are the last block of one series and the first of the next respectively.

The Cylinder Test was placed before the subject. While his attention was directed to it he was told the blocks would be removed and placed into the receptacle in the center, and that he was to replace the blocks as quickly as he could, using either one or both hands. If any of the blocks had been incorrectly placed at the end of the first trial, without saying a word to the subject, the experimenter made the changes necessary with the subject looking on. The subject, therefore, saw all the blocks correctly placed before he attempted the second trial. The blocks were again removed and placed into the central receptacle, and the subject told to replace them as quickly as he could. In case there were any errors on this trial the experimenter again made the proper corrections, removed the blocks as before and told the subject to replace them once more. If the subject failed to replace all of the blocks correctly the trial was scored a failure, that is, in this test 100 per cent accuracy is required on any particular trial. If any subject failed to replace the blocks correctly in all three trials his performance was considered a failure, regardless of the time required for the different trials.

For an adult the Cylinder Test tests: motor-control or accuracy of movement; rapidity of movement, interest, analytic concentration and distributive attention, discrimination of small differences in size, ability quickly to analyze and apprehend a new problem or situation, and learning ability, if three trials are given. The different abilities entering into the accomplishment of a performance test are sometimes subsumed under one classifying term: psycho-motor ability. The chief objection to terms of this character is that they do not designate precisely what the psychologist desires to know; the fundamental mental capacities tested by a given test. Psycho-motor ability is not equally connotative for operations at different performance levels.

The other tests employed were memory span and language tests. They were given as group tests, *i. e.*, the entire class was tested at one and the same time. The material used in the memory span test consisted of first, series of digits beginning with series of four and ending with series of twelve; second, series of short three-letter words beginning with series of four words and ending with series of eight; third, a paragraph of such length that no subject was capable of reproducing it verbatim upon one oral presentation. The method employed in giving the test for digits and words is the same as that described by Dr. H. J. Humpstone in his monograph, "Some Aspects of the Memory Span Test, A Study in Associability."[1] Before the paragraph to be reproduced was read the students were told to listen carefully and to reproduce in their own words the ideas it contained. This paragraph when logically analyzed contains sixteen ideas. All that is required of the subject is a reproduction of the ideas no matter how crudely they are expressed. The tests test the subject's ability to retain in consciousness a certain number of discrete elements or units long enough to reproduce them graphically after one oral presentation. In the reproduction of the paragraph the subject's ability to apprehend the relation of the ideas and the thought as a whole is tested, in addition to retention.

The language test employed is one of the Trabue tests. It consists of a series of sentences with certain words omitted. The instructions given to the subjects are that they are to complete the sentences, using words which make the best sense. Trabue has published standards which are to be used as a guide in scoring the completed sentences. The results for this group of students were carefully scored on the basis of Trabue's standards. Five minutes are allowed for the completion of this test. Any college student should have no difficulty in completing this test in the alloted time, so that a student's rating is determined by the quality of his results. The choice of words which are most appropriate to complete the sentences is what the test actually calls for. It tests a subject's imagination and language facility. More than one word may be chosen for a particular elision, but one of these may be more appropriate or elegant as to style. A sentence may be scored 0, 1 or 2: 0 if the words supplied distort the meaning, 1 if the words are poorly chosen and 2 if the selection of words completes the thought precisely. Discrimination in slight differences of meaning is what is required for a high score. There are eight sentences in the series. Sixteen is, therefore, a maximum score.

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[1] Humpstone, H. J.: Some Aspects of the Memory Span Test, A Study in Associability. Experimental Studies in Psychology and Pedagogy, No. 7 (1917). The Psychological Clinic Press, Philadelphia. Pp. 31.

Before taking up a distribution of the results of these tests I wish briefly to indicate the manner in which a student's average college grade was obtained. The grades recognized by the office of the Dean of the College are D, G, P, N and F, that is, a five-point scale is employed. Thus in referring to any student's grades they will be found recorded as D's, G's, et cetera. If we assume that the interval 90 to 100 on a percentile scale is the equivalent of D on the five-point scale, that 80 to 90 is the equivalent of G on the five-point scale, that 60 to 80 is the equivalent of P on the five-point scale, that 40 to 60 is the equivalent of N on the five-point scale, and that 0 to 40 is the equivalent of F on the five-point scale; the median values on a percentile scale for each of the above-mentioned grades would be D-95, G-85, P-70, N-50 and F-20. In order to strike an average college grade for each student these percentile median values were used. The number of D units which a student had received in different courses was multiplied by 95, the number of G units was multiplied by 85, the number of P units by 70, et cetera. The sum of these results was then divided by the total number of units. This average was again translated into a grade on the five-point scale. Any average result, therefore, between 90 and 100 was recorded—D, between 80 and 90—G, between 60 and 80—P and between 40 and 60—N. The intervals for D and G are equal; likewise the intervals for P and N, but the latter are twice as great as either of the former.

In distributing the results obtained from the tests, a five-point scale was also employed, 5 corresponding to D, 4 to G, 3 to P, 2 to N and 1 to F. The intervals for groups 5 and 4 are equal; the intervals for 3 and 2 are equal but they likewise are twice the magnitude of the intervals of 5 and 4. In this way the college grade and test rating for any given student are directly comparable. It matters little whether we call our best group the D group or group 5 as long as the method of distributing the results is consistently adhered to. A student's final rating in the tests was obtained in precisely the same way as his college grade. Each test rating was translated into a median percentile value, and the sum of all the percentile values divided by the number of tests employed, yielded a student's percentile test rating. This rating was translated into a rating on a nine-point scale: 5.0, 4.5, 4.0, 3.5, 3.0, 2.5, 1.5, 1.0. In order to distribute the test ratings on a five-point scale, the result of 4.5 and 4.0 are combined and the results of 3.5 and 3.0 are combined. The test ratings for the students in the class are based on the results of six tests: (1) The Formboard, (2) The Cylinder Test, (3) Memory Span for Digits, (4) Memory Span for Words, (5) Memory Span for Ideas—the Reproduction of the Binet Paragraph, and (6) A Trabue Language Test.

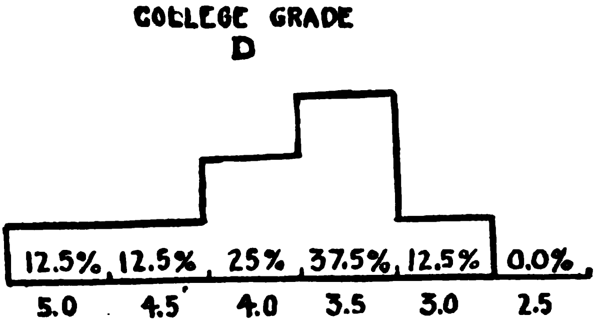
The following is a comparative table based on college grades and test ratings of 94 students. Each student's average college grade is compared directly with his average test rating. The table shows the percentage distribution of test ratings occurring for a given college grade.

Test Ratings.	College Grade D.	College Grade G.	College Grade P.	Total Distribution of Test Ratings.
2.5	......	....	6.1%	3.2%
3.0	12.5%	28%	27.3%	25.5%
3.5	37.5%	42%	48.4%	44.7%
4.0	25.0%	22%	18.2%	20.2%
4.5	12.5%	8%	......	5.3%
5.0	12.5%	....	......	1.0%

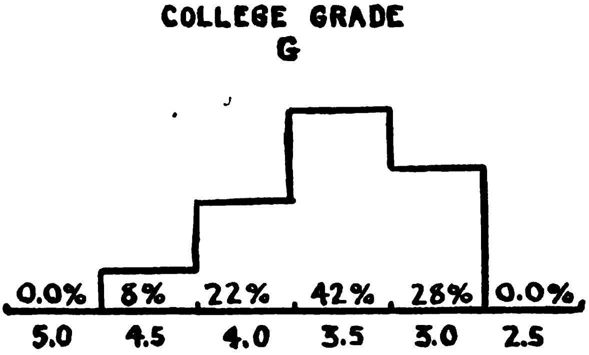
The above table shows that the mode for test ratings as a whole and for their distribution in each class of college grades is 3.5. Of the students having an average college grade of D, 50 per cent have test ratings greater than the mode, and these ratings are distributed among the 5.0, 4.5, and 4.0 classes of test ratings. In this group 12.5 per cent. of the students have a test rating less than the mode all in the 3.0 class. Of the students having an average college grade of G, 30 per cent have test ratings greater than the mode; these ratings are distributed among the 4.5 and 4.0 classes of test ratings —none appear in the 5.0 class. In this group 28 per cent of the students have a test rating less than the mode—all appearing in the 3.0 class. Of the students having an average college grade of P, 18.2 have test ratings greater than the mode; these ratings all appear in the 4.0 class—none appearing in the 4.5 and 5.0 classes. In this group 33.4 per cent of the students have a test rating less than the mode—27.3 per cent appearing in the 3.0 class and 6.1 per cent appearing in the 2.5 class. In connection with these comparisons, which show a decrease in test ratings percentage values above the mode and an increase below the mode as we descend in the scale of college grades; it is also interesting to note an increase in the magnitude of the mode as we descend in the scale of college grades: D—37.5 per cent, G—42.0 per cent, P—48.4 per cent. The number of students having N for an average college grade is so small that a comparison of test ratings within this group is not significant. In general then we may conclude that a comparison of the average college grade and of the test ratings of individual students shows that the less proficient a student is in college work, the less proficiency he displays in the tests. The foregoing comparisons are presented in the graphs on the following page.

An average test rating is an index of a subject's proficiency. The concept proficiency connotes the efficiency in a certain number of operations. An operation may be so simple as to arouse few mental abilities. In a more complex operation a greater number of mental abilities may be stimulated, or the same mental abilities may be aroused as in a simpler operation, only to a higher degree. In performing the formboard test the operation consists in replacing the blocks. For an adult this is so simple an operation that it becomes a speed test. The operation in the cylinder test also consists in replacing the blocks. This is a more complex operation because a greater number of movements are required and it calls for a higher performance level. Discrimination, analytic concentration and distributive attention are very definitely brought into play. This is also true of the formboard, but the nature of the cylinder test stresses these mental abilities or capacities. The fact that it is possible to observe various mental abilities or capacities in operation while the subject is performing a test of this type, gives these performance tests a definite and peculiar value in determining the proficiency of an individual. This is especially true of the cylinder test for the reason that no subject in three trials will replace the blocks with the minimum number of moves required.

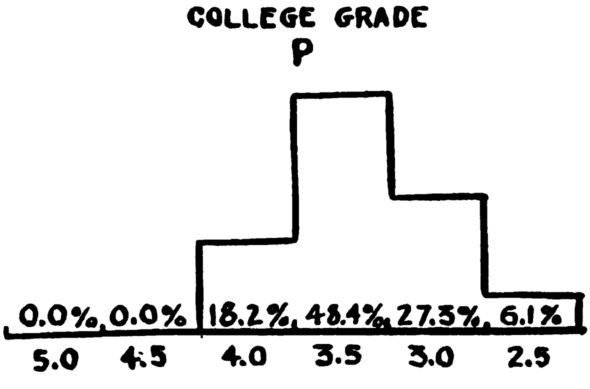
The operation in the graphic reproduction of the Binet Paragraph may be considered as being more complex than the operations involved in the performance of the formboard and cylinder tests because of certain intellectual acquirements necessary. In the Trabue language test imagination, a very fundamental and im-



GRAPH 1.



GRAPH 2.



GRAPH 3.

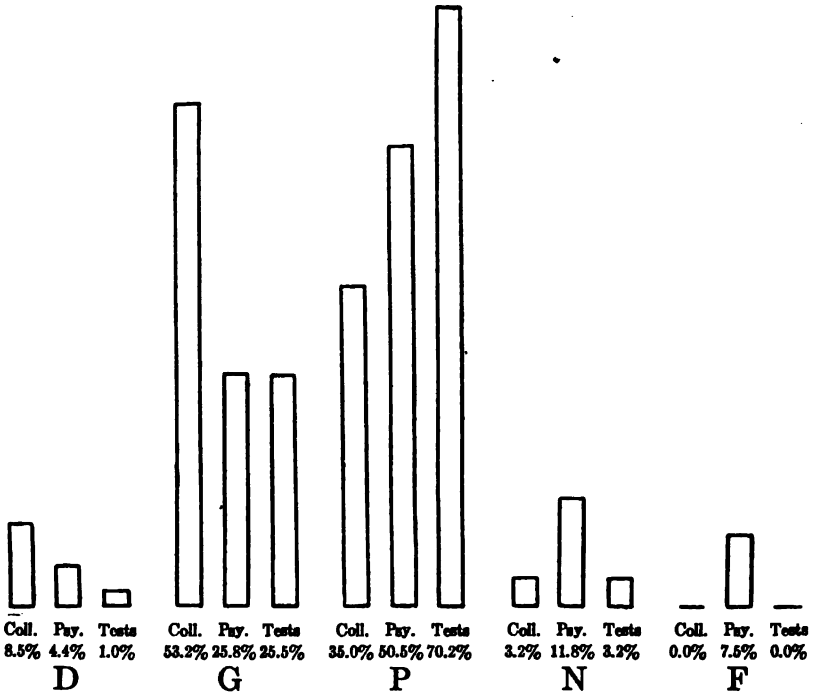
portant ability is stimulated. This ability is also brought into play by the formboard and cylinder tests. In the language test, however, a specific kind of imagination, the recalling of words, the result of a specific kind of training, is called into play. The average test rating, therefore, indicates the efficiency exhibited in the performance of certain operations, that is to say, the average test rating is a proficiency index.

In the following table and Graph 4 are shown the distribution of the college grades, the grades which the students received in Psychology 1, and the average test ratings.

	D.	G.	P.	N.	F.
Distribution of College Grades.......	8.5%	53.2%	35%	3.2%	0.0%
Distribution of Grades in Psychology 1	4.4%	25.8%	50.5%	11.8%	7.5%
Distribution of Test Ratings.........	1.0%	25.5%	70.2%	3.2%	0.0%

The comparison of college grades and test ratings shows that on the whole students displayed greater proficiency in college work than in the test. In my opinion this difference between the proficiency indices of the college grades and test ratings can be explained in the following terms: the standards in the test are rigidly and definitely fixed; in college work the student is granted the privilege of "making up" an exercise if it happens to be unsatisfactory; recitations and quizzes also help the student to prepare specifically for the examination at the end of the coures. This is not true of tests. The students in Psychology 1 constituted a selected group composed of sophomores, juniors and seniors. There was only a small number of freshmen in the course.

A comparison of the grades in Psychology 1 with the test ratings in the D, G and P groups shows that the former more nearly approximate the latter than the college grades. 11.8 per cent of the students received N for a grade in Psychology 1, while only 3.2 per cent received a similar grade in the college grades and test ratings. 7.5 per cent received F as a final grade in Psychology 1, while there are no students receiving a similar grade either in their college work or performance of the tests. In my opinion this is not so much due to a lack of ability on the part of the students who failed to pass the course in Psychology 1 as it is due to extraneous factors. Psychology may not appeal to these students in such a manner as to arouse sufficient interest. A new terminology has to be acquired and old concepts revamped. Terms such as sensation, for example, have a definite connotation differing from that which the student was wont to apply. In order to acquire these new meanings, and these new terms strict application is necessary throughout the greater part of the term in Psychology 1. The assignments are of such a character that if the student lags behind for a few weeks only he is unable to do justice to himself or to the subject. I believe that at the beginning Psychology 1 requires closer application than a majority of other college subjects. Some of the students fail to realize this fact until it is too late. Of course, no psychological tests are able to show whether a student will put forth effort to the best of his ability in college work. The contention may be urged that the tests given were entirely too easy. If this were the fact there should be a larger percentage of D's and G's, and the graphs would represent a curve skewed toward the D end and not in the opposite direction. With two exceptions the limits in the tests are determined by the results of the individuals of the group themselves.



GRAPH 4.

If the tests had been used as a criterion to any purpose, all students, with two exceptions, having passed the tests would have done satisfactory college work.

EFFECTS OF SMOKING ON MENTAL AND MOTOR EFFICIENCY.—*Conclusion.*

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EXPERIMENT II.

It has been mentioned before that the method in this experiment was to have the four subjects practice the tests until they ceased to improve and then to have them smoke in order to observe the results. These smoking tests were held the evening of Friday or Saturday of each week for four weeks. Each subject usually took all of the tests at 4.30 p. m. and immediately afterward smoked a cigar. As soon as it was smoked, the tests were gone through again and were afterward repeated at intervals of one hour until ten o'clock. They were also gone through twice the next morning, but in no case were any measureable effects found. In fact, from three to four hours after smoking the performances were so nearly normal again that the deviations might well have been accidental.

Tests Used: 1. Aiming: Steadiness of Motor Control; 2. Tapping Test; 3. Color Naming Test; 4. Addition Test; 5. Steadiness Test.

The materials used in tests 1 and 5 consisted of the brass plate and accessory apparatus described in Whipple's Manual, page 157. In test 5, the subject attempted to hold the stylus in the smallest hole of the plate for 15 seconds twice, without touching the sides of the hole. In both 1 and 5 the number of contacts was the measure used; in Number 2, the average number of taps in two periods of 30 seconds each; in number 3 the time taken to name one hundred colors; and in number 4 the time taken to add seven to one hundred two-place numbers.

There are five tables giving the main results of this experiment; the sixth table gives a summary of five other tables omitted for lack of space. This one shows the immediate effect of smoking on the various functions, and the disturbances are quite large as compared with the average of three performances one hour between.

Aiming: Steadiness of Motor Control.

From table I it will be seen that in the four smoking tests there were 321.2 per cent. more contacts after smoking than before for subject I., when the average of three tests was used as the measure. The increase for K was 13.1 per cent.; for R, 22C.5 per cent., and for J., 68.4 per cent. That is to say, that for every contact before smoking there were 1.48 after smoking. By glancing at table VI, it will be seen that the immediate effects are a great deal larger, being 633.3 per cent. for I.; 72.9 per cent. for K; 533.3 per cent. for R; and 130.4 per cent for J., making an average of 342.5 per cent. This means 3.42 contacts immediately after smoking to every one when not under the influence of tobacco.

Tapping Test.

Here an increase in number of taps means improvement. On an average for the four smoking series, only R increased his performance, and this by 1.4 per cent only; I dropped 3.5 per cent; K, 4.9 per cent; and J, 7 per cent, thus making an average drop of 3.7 per cent for all tests for all subjects. Curiously enough, this result is larger than that obtained when the immediate effects were measured, the falling off in performance being only 3.4 per cent. This is due to the low mark made by J here which is 2.1 per cent compared with 7.7 per cent in the other case. The effects of smoking are clear and consistent for almost every test, although not so large as in aiming.

Color Naming.

Table II shows that it took K 4.2 per cent longer to name 100 colors after smoking than before; R 2.4 per cent longer and J 0.3 per cent. shorter, making the average time of three tests an hour between after smoking 2.1 per cent longer than before smoking. Table VI shows that the average for the three subjects in the test immediately after smoking is 11.5 per cent longer than before smoking, subjects R and J having their times increased 14.7 per cent. and 14.2 per cent. respectively, while K's is only 6.1 per cent. longer.

Addition Test:

Here we have rather unexpected results in that the time to add is shortened considerably in most instances. This is especially true of R who found that smoking stimulated both his efficiency and accuracy to a remarkable extent, which decreased as time went on until he again reached the normal after a few hours. For J the time was increased slightly, making the total decrease for the three subjects 2.4 per cent. K displayed irregularities in performance; it will be seen in table VI that his time in the test immediately after smoking is 7.4 per cent longer than before smoking, while in table IV, including two subsequent tests, the time is 1.0 per cent less. R's results are consistent in the two cases.

Steadiness Test.

This test is especially adapted to show slight tremors of the hand and arm muscles, and we find that smoking increases them very decidedly. Table V shows that the increases in number of contacts for I is 86.4 per cent; for K 20.7 per cent; for R 33.3 per cent; and for J a decrease of 40.0 per cent. The results for J are not very conclusive either in this or the other tests as this subject was unable to take more than one smoking series. The average increase in contacts for all four subjects in the three tests after smoking is 25.1 per cent, as compared with 192.2 per cent in the test immediately following smoking. The individual scores are given in the last column of table VI.

It will be noted that in experiment II no attempt has been made to measure the number of errors. The only account taken of them was to have the subject stop and correct himself whenever he made any. The only data gathered are those of the time taken to a definite amount of work, or of the amount of work done within a specified time.

The results prove that the effects of smoking are very detrimental to muscular control and also to the purely mental processes studied. This confirms the results of experiment I. There are some individual differences, as with subject R in addition and K in aiming, which are too large for chance variations, but might be explained on other grounds which are so purely hypothetical as not to be dealt with here. In a larger number of tests, it would probably be found that the ones showing a positive aid from smoking would be so small as not to be of any especial significance.

The following table is a summary of the main results. It shows the effect on performance immediately after smoking and two hours after smoking for all subjects for all tests in experiment II. The figures are averages.

	Per Cent decrease in Performance.	
	Right After Smoking.	Two Hours After.
1. Aiming: Steadiness of Motor Control (Increase in errors)	624.5%	132.9%
2. Steadiness (Increase in errors)	192.2%	13.7%
3. Color Naming (Increase in time)	11.5%	5.3%
4. Tapping (Decrease in No. of taps)	3.4%	6.4%
5. Adding (Increase in time)	2.4%	5.1%

EXPERIMENT II.—TABLE I.

Aiming Test.

Numbers are averages of three performances before and three after smoking for each smoking test, the tests after smoking being given at intervals of one hour.

Subjects	First Smoking Test			Second Smoking Test			Third Smoking Test			Fourth Smoking Test			Aver. of Differences.
	1	2	3	1	2	3	1	2	3	1	2	3	
			%			%			%			%	%
I.	2.3	12.3	434.8	1.5	6.0	300.0	0.5	2.0	300.0	1.0	3.5	250.0	321.2
K.	64.0	49.6	−22.5	55.6	30.0	−46.0	2.5	1.0	−40.0	1.0	2.6	160.0	13.1
R.	2.0	7.3	265.0	2.0	8.6	330.0	3.0	5.0	66.6	......	......	....	220.5
J.	26.3	44.3	68.4	......	......	....	......	......	....	......	......	....	68.4
Average per cent difference between 2 and 1...........			186.3			194.6			108.8			205.0	148.8

EXPLANATION.

1. Under 1 are given the average number of contacts in three trials before smoking.
2. Under 2 are given the average number of contacts in three trials after smoking.
3. Under 3 are given the difference in per cents between 1 and 2. Increase in number of contacts means decrease in performance.

EXPERIMENT II.—TABLE II.

Tapping Test.

Showing averages of three performances before and three after smoking for each smoking test, the tests after smoking being given at intervals of one hour.

Subjects	First Smoking Test			Second Smoking Test			Third Smoking Test			Fourth Smoking Test			Aver. of Differences
	1	2	3	1	2	3	1	2	3	1	2	3	
			%			%			%			%	%
I.	239.0	232.0	−2.9	247.0	245.0	−.8	257.0	243.0	−5.4	237.0	225.0	−5.0	−3.5
K.	294.0	306.0	4.0	299.0	266.0	−11.0	281.0	234.0	−16.7	290.0	302.0	4.1	−4.9
R.	267.0	283.0	5.9	280.0	286.0	2.1	282.0	271.0	−3.9	......	......	....	1.4
J.	231.0	213.0	−7.7	......	......	....	......	......	....	......	......	....	−7.7
Average per cent difference between 2 and 1...........			−.17			−3.2			−8.6			−4.5	−3.7

EXPLANATION.

1. Under 1 are given the average number of taps in three trials before smoking.
2. Under 2 are given the average number of taps in three trials after smoking.
3. Under 3 are given the difference in per cents between 1 and 2. Increase in number of taps means improvement in performance.

EXPERIMENT II.—TABLE III.

Color Naming Test.

Showing averages of three performances before and three after smoking for each smoking test, the tests after smoking being given at intervals of one hour.

Subjects	First Smoking Test			Second Smoking Test			Third Smoking Test			Fourth Smoking Test			Aver. of Differences.
	1	2	3	1	2	3	1	2	3	1	2	3	
K.	44.3	44.0	% .7	43.6	45.3	% 3.8	40.5	45.5	% 13.5	43.3	42.7	% −1.3	% 4.2
R.	55.6	55.0	−1.1	55.6	58.3	4.8	55.5	57.6	3.7	......	......	......	2.4
J.	47.3	47.2	−.3	......	......	......	......	......	......	......	......	......	−.3
Average per cent difference between 2 and 1...........			−.2			4.3			8.6			−1.3	2.1

EXPLANATION.

1. Under 1 are given the average length of time for three trials in naming 100 colors before smoking.
2. Under 2 are given the average length of time for three trials in naming 100 colors after smoking
3. Under 3 are given the differences in per cents between 1 and 2. Longer time under 2 indicates poorer performance after smoking.

EXPERIMENT II.—TABLE IV.

Addition Test.

Showing averages of three performances before and three after smoking for each smoking test, the tests after smoking being given at intervals of one hour.

Subjects	First Smoking Test			Second Smoking Test			Third Smoking Test			Fourth Smoking Test			Aver. of Differences.
	1	2	3	1	2	3	1	2	3	1	2	3	
K.	44.3	44.1	% −.2	43.6	45.3	% 3.9	61.0	58.0	% −5.0	62.0	60.3	% −2.7	% −1.0
R.	109.6	97.6	−10.9	94.0	92.0	−2.1	92.0	82.0	−10.8	......	......	......	−7.9
J.	88.0	89.6	1.8	......	......	......	......	......	......	......	......	......	1.8
Average per cent difference between 2 and 1...........			3.1			.9			−7.9			−2.7	−2.4

EXPLANATION.

1. Under 1 are given the average length of time of three trials at adding before smoking.
2. Under 2 are given the average length of time of three trials at adding after smoking.
3. Under 3 are given the differences in per cents between 1 and 2. Longer time under 2 indicates poorer performance after smoking.

EXPERIMENT II.—TABLE V.

Steadiness Test.

Showing the averages of three performances before and three after smoking for each smoking test, the tests after smoking being given at intervals of one hour.

Subjects	First Smoking Test			Second Smoking Test			Third Smoking Test			Fourth Smoking Test			Aver. of Differences.
	1	2	3	1	2	3	1	2	3	1	2	3	
			%			%			%			%	%
I.	5.0	5.1	2.0	2.5	3.0	20.0	2.7	8.2	203.7	1.5	3.3	120.0	86.4
K.	11.0	16.0	45.4	7.7	8.8	14.3	3.0	3.2	6.6	3.0	3.5	16.6	20.7
R.	3.3	5.1	54.5	3.0	4.6	53.3	2.5	2.3	−8.0	......	......	....	33.3
J.	3.5	2.1	−40.0	......	......	....	......	......	....	......	......	....	−40.0
Average per cent difference between 2 and 1...........			15.5			30.9			72.8			68.3	25.1

EXPLANATION.

1. Under 1 are given the average number of contacts for three series of two trials each before smoking.
2. Under 2 are given the average number of contacts for three series of two trials each after smoking.
3. Under 3 are given the differences in per cent between 1 and 2. A larger number of contacts under 2 indicates poorer performance after smoking.

EXPERIMENT II.—TABLE VI.

This table is condensation of five tables made up in the same manner as I, II, III, IV, and V, except that instead of giving the averages of three performances before and of three after smoking, they represent the averages of three performances before smoking, but give the results of the first series of tests immediately after smoking, thus showing the most pronounced effects possible in this experiment. Only the columns "Average of Differences" from each of the other tables is given here.

	Aiming Test	Tapping Test	Color Naming Test	Addition Test	Steadiness Test
Subjects	Average of Differences	Average of Differences	Average of Differences	Average of Differences	Average of Differences
I..........	633.3%	−5.5%	....	....	197.5%
K..........	72.9%	−3.6%	6.1%	7.4%	307.9%
R..........	533.3%	−2.3%	14.7%	−10.1%	235.1%
J..........	130.4%	−2.1%	14.2%	9.8%	28.5%
Average.....	342.5%	−3.4%	11.5%	2.4%	192.2%

IRREGULARITY ON A BINET EXAMINATION AS A MEASURE OF ITS RELIABILITY.

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The writer became much interested, while serving as Assistant Psychologist at the Boston Psychopathic Hospital in the summer of 1916, in "irregularity" on a psychological examination as shown by insane patients. The results of a special study of this subject, using the Point Scale, have already appeared,[1] and were summarized briefly in a paper at the annual meetings of the Psychological Association in December, 1917. In this paper a method for stating "irregularity" on the Binet scale was also suggested. Briefly, this method consisted in adding together the number of months failed below the mental age (each failure being multiplied by the number of years away from the mental age at which the failure occurred) and the number of months passed above the mental age (each success, again, being multiplied by its distance, on the scale, from the mental age). The present paper is a brief report of results obtained, using this method of figuring the "scatter," with the Stanford Binet scale.

A word should first be said in explanation of the method. The method for stating "scatter" most in the spirit of the Binet scale would, the writer believes, be simply to add together the failures below the mental age and the successes above. This gives, as a matter of fact, results of not a little interest. But it is obvious that a failure one year below the mental age is not of the same importance as a failure four years below the mental age; a success one year above the mental age is of much less significance than a success four years above. To put the situation concretely, a child with a "mental age" of ten years, who fails a six-year test and passes a sixteen-year-old test, is much more interesting material for further study than the child with a ten-year mentality who fails nothing below the nine-year group of tests and passes nothing above the twelve-year group. The expedient was, therefore, adopted of multiplying the value of each test appearing in the irregularity by the number of test groups which that test was away from the mental age. In the case of the ten-year-old child first mentioned, the failure of "two months' worth" of test at six would be multiplied by three (this being the number of test groups away from the test group in which the mental age appears).

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[1] Pressey, S. L.: "Distinctive Features in Psychological Test Measurements made upon Dementia Praecox and Chronic Alcoholic Patients," *J. of Abn. Psychology*, June, 1917, and "Irregularity as a Measure of Deterioration," same Journal December, 1918.

And the five-months' worth of success in the sixteen-year test group would be multiplied, again, by three—the number of test groups away from that test group in which the mental ages falls. We will suppose that the mental age of this child was 9–8, that he failed one test in the six-year group, one test in the seven-year group, two tests in the eight-year group and one test in the nine-year group. The number of successes or failures in the ten-year group is of no interest; if the examination were perfectly even the child might fail any two of the ten-year tests without its being possible to consider him other than typical. The two months of failure at nine would be counted as two months of irregularity, the four months at eight as eight months' irregularity, the two months at seven as six months' irregularity, and the two months of failure at six as eight months' irregularity. In similar fashion we may suppose this extraordinary child to pass one test or "three months' worth" at twelve, to fail all the tests of the fourteen-year group, but to pass one test of the sixteen-year group. The irregularity in the twelve-year group (one test group away from that test group in which the mental age falls) would be counted as three months in making up the total of irregularity, and the five months' worth of success in the sixteen-year group would be multiplied by three—the number of test groups which this last success is away from the test group where this child should, if the examination had been perfectly even, have stopped succeeding.[1] The total irregularity, as thus figured, would be forty-two.

The present brief study is based on irregularities, thus figured, from 141 white children, 51 colored children and 16 adults. The white children have, of course, been the basis of comparison. They range in age from four through fifteen. The distribution by I. Q. will be given shortly; many were tested as special cases—either sub-normal or brilliant. The group is thus not a representative one, but does well enough for the rough comparisons here presented. The number of cases and median irregularity at each age are as follows:

Age..................	4	5	6	7	8	9	10	11	12	13	14	15	
No................	1	1	12	13	18	10	24	25	17	12	4	4	141
Median............			8	10	8	12	9	13	9	8	10	10	10

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[1] The question will naturally be asked as to why this success at sixteen was not multiplied by six, the number of years which this success is away from the mental age. This procedure was tried; it was found, however, that since the tests above ten are already progressively weighted, the handling of the scores in this fashion tended to double-weight irregularities above ten and increase excessively the amounts for the older children. The method can best be understood by clearly grasping its purpose. What is being sought, of course, is a statement of total variation of successes and failures about the mental age which shall give an expression simply, and solely, of the consistency of a subject's responses to the different parts of the examination, and which shall make possible a direct comparison of the consistency shown by different subjects, and at different ages. And the difficulties encountered are due to the fact that the mental age is not an average but a sum, and that even the Stanford scale is not sufficiently systematised for any very satisfactory statistical treatment.

The small number of cases at certain ages permits only tentative conclusions from these results, but the medians would suggest that the irregularity was fairly constant over the range of these ages.[1] If we may suppose irregularity to be at least roughly constant over these ages, it will be permissible to lump the cases of different ages in studying possible relations of irregularity to "brightness." The results, when the cases are grouped according to I. Q., are as follows:

I. Q.	-76	76-90	90-110	110-125	125-	
No.	23	37	42	24	15	141
Median	9	8	9	10	14	

Clearly irregularity is, as thus stated, not distinctive of subnormality.[2] A greater scattering of scores in examinations from superior children might seem suggested. But the increase is slight, individual differences are great; the slightly greater irregularity can hardly, when everything is considered, be thought of any practical importance. In fact, it is hard to see *any* value in such a measure of irregularity—unless, possibly, as a special method in the study of examinations from insane patients.

The results from the colored children and the adults put a different light on the situation, however. The 51 colored children referred to in the beginning of the paper make up all the pupils (except some few who dodged the examination) in a small colored school. The number is too small for tabulation by age; but the group as a whole gives a median of 14 units irregularity. The 16 feebleminded adults show a median irregularity of 26. Such findings surely suggest that though irregularity may not vary with "brightness" it may, nevertheless, be indicative of some factor of importance in the examination. To see whether some further understanding of the situation might not be given by intensive study of extreme cases, the children showing the highest ten per cent of irregularity were especially considered.

Only 15, or about 11 per cent, of the total 141 white children, show irregularities of 20 or over. The girl who shows the greatest irregularity (71 units, as compared with the average of 10) is the child of a university professor. Although twelve years old she has never attended school, never plays with other children, spends most of her time in reading, has been educated by her mother. The girl is thus distinctly abnormal in mental make-up and training. Another girl, with an I. Q. of 94, has an irregularity of 27. Her vision is so defective that her teacher says she can "scarcely see even with glasses;" the teacher also says that home conditions are "dreadful." A third girl with an I. Q. of 72 and an irregularity of 22 has been out of school much, and is just recovering from pneumonia. A boy with an I. Q. of 101 and irregularity of 26 was, the examiner notes, impatient of the examination, wished to get through with it as quickly as possible, and did not give satisfactory attention. Another boy—thirteen and a half years old, and in the fifth grade—gave an I. Q. of 91 and irregularity of 34. It was found after making the examination that the boy had been tested before. The second examination was made toward the close of the school year, after a large number of his classmates had been "Bineted." There was good reason to believe that the results of the first examination (which had been for practice), along with talk among the pupils, had influenced the examination; the scale rating was much higher than was expected by either examiner or teacher.

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[1] Similar results were found for irregularity on the Point scale, as described in the writer's papers above referred to.

[2] The results are thus in accord with Dr. Wallin's interesting paper, dealing with this subject in a slightly different way. Wallin, J. E. Wallace, "Irregularity and Feeble-mindedness," *Psychological Clinic* 11; 179-195, 1917, and with the results of the writer already mentioned.

In fact, of the fifteen children of irregularity 20 or over there were only three who were not known to have some marked peculiarity of mental make-up or training, or whose examinations were not qualified by some such special circumstances. Something the same situation appears in the case of the adults. They were all, with two exceptions, inmates of a county poor asylum. Again, with two exceptions, they were over forty years of age. A number had more or less defective vision, several showed illiteracy beyond what would be expected from the amount of their mental defect. That is, most of the cases were old enough so that some affects of maturity[1] (or, perhaps, of senility) upon the make-up of the examination might be expected. And the majority suffered from special handicaps of one sort or another which might be expected to affect the consistency of their showing in the examination.

The slightly greater irregularity of the colored children the writer is inclined to explain in analogous fashion. Previous work has shown negro children to give a somewhat distinctive "pattern" of scores on a group of psychological tests.[2] An innate difference in abilities is naturally suggested. Anyhow, the average colored child surely comes from a total environment very different from the mental environment acting upon the white child; standards of living, moral and social attitudes, sentiments and ideals and interests and ambitions, are all subtly but powerfully different. And it would seem not unreasonable to expect the sum of such influences to have some effect on the reactions to a psychological examination.

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[1] The writer has already presented some evidence to show that individuals over twenty give examinations distinctly different from the examination given by a child of the same "mental age." See Pressey, S. L. and Cole, L. W. "Are the Present Psychological Scales Reliable for the Examination of Adults?" *J. of Abn. Psychoogy*, December, 1918.

[2] See, for instance, Pyle, W. H. "The Mind of the Negro Child" *School and Society* 1: 357-60, 1915; Ferguson G. O., Jr.: "The Psychology of the Negro: An Experimental Study," *Archives of Psychology*, No. 36, 1916 p. 138, Sunne, Dagny: "A Comparative Study of White and Negro Children," *J. of Applied Psychology*, 1: 71-83, 1917;; Loades Redfern, H., and Rich, S. G. "Binet Tests on South African Natives—Zulus," Ped. Sem. 24: 373-83, 1917.

The conclusion is, of course, that a high irregularity indicates the presence in the examination (and in the score) of some more or less irrelevant factor, preventing a standard measurement of the "general intelligence" of the individual. A very unusual education or environment, marked sensory defect,physical illness,poor co-operation, possibly age and racial peculiarity, may thus operate to prevent a satisfactory rating. And when they do thus operate, they show their presence most distinctively by increasing the irregularity. Irregularity might thus be said to give a measure of the reliability of an examination—of its freedom from such factors.[1] And a statement of irregularity would seem of little less importance than the mental age and I. Q. in summarizing the findings of an examination.

These are obviously very far-reaching conclusions from a very small amount of data. The present paper has been intended only as a suggestion of methods and problems—and beyond this has tried only to demonstrate that there is in this subject of "irregularity" somewhat more promise than has ordinarily been supposed. *A priori* it would seem as though we needed, as a matter of ordinary statistical precaution, some measure of the dispersion, as well as of the average or sum, of the scores obtained with a composite group of tests on a given individual. And the few results above presented surely suggest an actual value for such a measure in the use of the Binet scale. The writer hopes further studies may be made of the subject.

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[1] It might be said that the writer believes the irregularity shown by mentally diseased individuals should be interpreted in the same way. Irregularity need not, in such instances, be the result of deterioration. It may be simply the result of absorption in a delusional system, of distraction by hallucinations, of negativism, retardation, or other relatively temporary conditions. But it is always the result of *some* factor which makes the examination unreliable as a measure of the patent's intact mentality.

EFFICIENCY AND OTHER FACTORS OF SUCCESS.[1]

BY LIGHTNER WITMER, PH.D.

There is a great deal of doubt as to what psychology really is. Not long ago a visitor to our laboratory said to me, "I came all the way from Florida to see you because you are a psychologist. I am a psychologist, too, I can psychologize, and so can my wife." They turned out to be professional hypnotists.

"Oh, yes, I have heard of tests like that being made on bald-headed men," someone recently exclaimed, as I was speaking of a very common laboratory experiment, the assumption apparently being that when a man is minus hair on the top of his head you can get a little bit nearer to his mind.

It is difficult to state just what psychology is, but I can tell you what the psychologist studies. He studies just what you are compelled to study every day of your life, the behavior of human beings. We study mental abilities through the performance of those whom we observe. When I test a student in my psychological laboratory, or when parents bring children to me for the purpose of having them examined, all that my tests do is to provide a material means or agency by which I cause the child to perform in my presence, so that I may observe what he can do and what he can't do.

That is the reason why psychology is so closely in touch with human life, and that is the reason why the word "efficiency" is one which we have regularly used in the field of psychology. Mr. Taylor has made this word very well known to all of us, and I think he uses the word in its proper sense. There is also the problem of efficiency of school management which was first proposed by a superintendent of schools who subsequently became an efficiency expert for a whiskey trust.

Since the war has been on, this term *efficiency* has come very much to the front. Some say, "Now that the Allies have won, we know that they have greater *efficiency* that the Germans." Others say, "Now that the Germans have been beaten, thank God we shall hear no more about *efficiency!*" Evidently there is lack of agreement as to what this much-used word actually means.

On my way back from Italy last June, I had a talk in London with the head of the Welfare Department of the Munitions Bureau about the kind of work they were doing for the workman. As a result of that enlightening conversation, I said, "I see that you are not interested in *efficiency* at all; you are interested in what I call *competency*." He asked, "What do you mean by efficiency?" After explaining to him my use of the two terms, he said, "You are quite correct. In this department we are not concerned with a maximum output in the minimum amount of time. We are only interested in seeing that the laborers are in a fit condition to do satisfactory work."

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[1] Tuesday Luncheon Address, given at the Engineers' Club of Philadelphia, December 3, 1918, and reprinted with a few corrections as originally published, from the stenographic notes, in the Journal of the Engineers' Club of Philadelphia, Vol. XXXVI, No. 2,, Feb. 1919.

I believe clear thinking is essential to successful work, whether in the school or in the business of earning a living. Certain concepts in connection with our study of the human problem are coming out of this war which it is extremely important for us to try and define a little more precisely. One of these is the word *efficiency*. Another much misused term is the word *intelligence*. We hear of "intelligence testing" and we hear of "efficiency management." There is an aspect of every human performance which requires us to use the term *efficiency*, the one wherein we look upon the performance as an operation which has as its purpose the production of a desired result. We examine the expenditure of time and effort in securing that result. Efficiency exists only when the result is related to the expenditure of time and effort, and this relation is quantitatively measured.

The attainment of maximum *efficiency* is only *one* way of achieving success. Another way of achieving success is through the exercise of intelligence. I use the word *intelligence* to mean invention, the ability to solve a new problem. In its hightest manifestation it is what we call *genius*. In its lowest manifestation it is what we call *cunning*. It is possessed by the young as well as by the old, and by the lower animals as well as by man.

We are constantly confronted with performances where we must distinguish the relative efficiency of individuals from their relative intelligence. It has been, to my mind, a conspicuous result of the achievements of this war that the Germans, despite their greater *efficiency* in industrial and military organization, have been beaten by the superior *intelligence* of the allied peoples. To my mind it does not help us in analyzing the situation to say that because the Allies have won the victory it means they had the greater efficiency. When, for examples, Hippomenes and Atalanta ran their famous race and Atalanta stooped to pick up the golden apples, it did not prove that Hippomenes was the more efficient runner, but that he had a higher intelligence than Atalanta. And so with another famous race—that of the hare and the tortoise. When the tortoise won the race because the hare went to sleep, the tortoise did not prove that he was the more efficient runner, but only that he stuck to his job and the hare trusted too much to his superior ability.

Efficiency can be acquired only as the result of discipline through constraint, training, and practice. It is the result of the same performance done over and over again until the maximum amount of output is obtained with a minimum amount of effort. We do not like efficiency, because it exists in an atmosphere of monotony and requires us to put forth strenuous effort. We like our *employees* to be efficient, our *students* to be efficient; but, as for ourselves, we prefer to be *intelligent*, that is to say, we like to achieve success by our wits and not by work.

Success is not achieved solely through efficiency. Because American business men and American professional men have achieved success and acquired wealth and honors is no proof that they are efficient. Efficiency is one thing; the employment of intelligence in order to accomplish a result without efficiency is a very different matter. These are two distinct aspects of every performance and they stand with respect to each other at the opposite end of the poles. There is nothing which differs so much from efficiency as this mental quality which I call intelligence.

Knowledge, we are told, is power. Knowledge is acquired by the exercise of memory: which means, again, either the training of the memory and the acquisition of ideas at some relatively low intellectual level for the purpose of producing *efficiency* or the acquisition of knowledge in order to arrive at *new* ideas. For example, the new discoveries with respect to by-products and the introduction of by-products in the manufacturing industries, do not add to efficiency. It is the introduction of a new bit of knowledge by virtue of which a new line of performance is carried on.

Now, as we make so many of our successes through acquiring new knowledge, it is of great importance that we should consider what kind of knowledge is to be acquired and what will be its results and consequences.

There is a certain kind of knowledge called professional knowledge—professional skill—which comes fairly close to efficiency, but which, in the higher regions of intellectual thought, does not involve efficiency at all, but processes that had better be called *imagination*, which brings it a little closer to this other capability which I call *intelligence*. A man's knowledge may be professional knowledge and lead him to success in his line of work; or, on the other hand, his knowledge may be of human character. A man may succeed as an engineer or as a doctor—not because he is a good engineer or a good doctor *per se,* but because he understands human nature, can pass a good bluff, or has a lot of good friends.

There is one kind of knowledge which, as a university man, I consider extremely important: that is, knowledge for its own sake—the possession of a certain amount of knowledge for the sake of acquiring new knowledge—knowledge which forms a basis for further investigation. In my opinion, the great advances of the world have come, through men of intelligence, men of genius, who have employed in specific sciences such knowledge as they were able to acquire in order to gain new knowledge. Other persons may subsequently have carried their results to a successful conclusion. For example, the aëroplane was invented by an American—Professor Langley, who barely achieved success; yet, nevertheless, he did succeed. Others took the idea and advanced it. It is said that the submarine is not a German invention, nor mustard gas, but Germans took the idea and developed it. That is what I mean by knowledge further developed in the direction of efficiency; and our institutions, should be ready to develop and apply all kinds of knowledge. In addition, some corner of the institution should be reserved for those who are interested in acquiring new knowledge for its own sake; for, after all, it is to this fountain spring that those who develop and apply knowledge must come.

There is another factor which enters into all our work, a factor of great importance, and that is what I can only vaguely call *judgment.* Good judgment is only to be acquired as the result of experience. I observe good or bad judgment employed by every individual I examine. It comes out in his attempts at solving the simplest test. He must choose certain methods of operation if he solves the test which I put before him, and he will display good or bad judgment in solving it.

Then there are certain principles which underlie good judgment which are mainly balance and common sense. I think it is commonly admitted of the French as of the English, that throughout their political development there has been manifest a faculty of common sense. They both say, "Believe in this ideal, but do not believe in it too strongly;" "do this, but do not do it too hard." Some find in this, something of hypocrisy and something of the cult of the amateur. But, on the other hand, it leads to compromise. This has come out distinctly in the war. What the Germans did was to choose a certain principle of action. People, whether individuals or nations, must choose certain principles to govern their actions. The Germans chose *force*—a good idea, an idea which appeals to many of us. We do not reject force. But the Germans elevated force to an *ideal*—

to something which was to be made irresistible and which was to be carried out to the limit, no matter what humanity or morality might have to say against it. On the other hand, other nations said, "We believe in discussion, argument and compromise, but with force always in the background."

This principle of compromise is often applied to our moral principles. "Honesty is the best policy," we say, and so it is. That is the right ideal to put before a man as his standard of living. Yet anybody who lives in the world knows that success is conditioned not only by following that policy—it is conditioned often by making compromises with it. The same may be said of lying. It is not safe to say, as Bethmann-Holwegg said, that "Necessity knows no law." As a matter of fact, it *does* know no law under certain circumstances; but that is not the proposition to put before humanity as a rule of conduct. Good judgment calls upon us to select the opposing principle, "law," which yet permits of exceptions. We say that we are law-abiding citizens, and yet each man feels within himself the right to annul the law when it comes to certain critical situations.

When I was in Italy, I had a very amusing illustration of this, which, among other things, made me say, "After all, Italians are very much like ourselves." Several men were arrested on the train traveling from Messina down to Syracuse, along the eastern coast of Sicily, because they had kept the curtains of their windows up. The printed orders in the compartments read: "All curtains are to be drawn as soon as the lights are lit"—the reason being that there were German submarines along the coast and danger of the train being shelled. One of these men when arrested said he did not know he had to pull the curtain down. He was asked, "Didn't you see the sign up in your compartment to the effect that the curtains must be pulled down?" "Yes," he replied, "I saw the sign, but I also saw signs, 'Don't spit on the floor,' and 'Don't smoke,' and nobody ever pays any attention to them."

In the selection of our rules of conduct and in the way in which those rules of conduct are observed, you will generally find that the principle which has brought success to some men or groups of men has been the principle of compromise. Take the uncompromising attitude of some of the socialistic minorities. Whatever we may think of their doctrines, whether we think them good or bad, the question remains of our having to deal with groups who will apparently decline to enter into any compromise at all—who either want the whole loaf or none. A certain balance and judgment, which seems to be necessary in political life, is also to be found in every single performance, whether produced by a laboratory test or as a part of any man's ordinary life.

In all this, as I see the situation which comes before us, there are those two main questions: an external one of the operation—the man in action and our estimate of his action as such, and efficiency is a term which relates to that; on the other hand, there is the internal—the man himself displays certain abilities, which we indicate when we say, "He is an able man, he has intelligence, intellect, and sound judgment."

I think it may help everyone, as it certainly has helped me, to distinguish between this external aspect of work which is efficiency and these internal attributes which constitute a man's competency. A competent man—a healthy man—is not necessarily efficient. He has the advantage over an incompetent or sick man in being able to develop efficiency or to be trained for efficiency. If we are selecting men on whose training we are going to spend time and effort, undoubtedly we want to select the more competent men.

Whenever an institution asks my advice on training young men for successful careers, I say to them, "If you are trying to give these men professional training—efficiency on the one hand and skill on the other—and you wish to fill their minds with knowledge which you hope they will put to good use, you ought to provide opportunity for the exercise of intelligence, because efficiency training tends to dull intelligence."

That is the problem of the school, but an equally important problem, if we are going to send out into the world well-trained professional men, is to eliminate the unfit from the schools. To my mind this question is every bit as important as the curriculum and methods of instruction. We must devise some method whereby we can select those whom it is worth while to educate. Competency comes up in connection with our institutions of higher learning, just as it comes up in connection with the elementary grades. Take, for example, in the public schools, one of the problems which I have to face many times: that of the fourteen- or fifteen-year-old boy or girl who has advanced only to the third or fourth grade, and who is not able to satisfy the requirements with respect to English, and therefore cannot get a working certificate until he or she is sixteen years of age. I make an examination, determine the proficiency in reading and writing, and decide that within the time of the school period the pupil can not be brought up to the level required by law. Eliminating other considerations, to my mind it is very much better to let the child go to work under, perhaps, certain kinds of guidance, than to force him to attend a school where he will simply spend another year or two doing little or nothing; because the results of the examination have shown that he has not the competency which will enable him to acquire the proficiency demanded by the school standards.

Psychological tests were employed in connection with the selection of men for the army, both as privates and as officers; and there can be no doubt that these tests will be further developed and perfected. As a result of the war and what will grow out of it, we are going to have a tremendous development of industrial organization along the lines of efficiency and applied knowledge. It is certain that our professional schools will become more numerous. Already government subsidies have been given for the establishment of such institutions in England, and America will have to follow suit.

We need not fear, therefore, for the satisfactory development of professional schools; but we *do* need to fear for the maintenance and further development of schools that have as their main object the cultivation, the acquisition and the discovery of new knowledge for its own sake. If this is the aim of the graduate school, then it means the further development of graduate schools. Surely all professional men, but especially engineers, can appreciate the difference between the mechanic and the inventor. Some men and some institutions must live in the pursuit of new ideas, and in the acquisition of knowledge for its own sake instead of for the sake of using that knowledge to secure wealth or success.

THE CHILDREN OF A JEWISH ORPHANAGE

A Preliminary Report of a Psychological Survey.

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This report is based upon the examination of 155 children in a Jewish orphanage in Philadelphia. The original purpose of the investigation was to compare the performance level of this group of children—showing an average school retardation of over one year—with the performance level, measured quantitatively, of an unselected larger group, using tests which had been standardized with the unselected group. The Witmer Form Board, the Cylinder Test and the Memory Span Test, standardized by Young, Paschal and Humpstone, respectively, were selected for this purpose. In its final development, however, the investigation took on the character of what might be called a psychological survey—the sifting process by which a large group may be examined for the purpose of picking out those who for one reason or another should be subjected to a thorough clinical examination. There was a shifting of emphasis in the examination from the quantitative statement of the results of a given performance to the analytic diagnosis of the performance on the basis of the competencies and efficiencies which are involved in it. To test fully, however, even in a preliminary way, the adequacy of certain competencies and efficiencies required the introduction of other tests especially fitted for the individual case, and such tests as the design blocks, the Knox Tapping Test and selected tests from the Stanford Revision were employed in individual cases. On the basis of the qualitative performance of the tests, certain individuals were picked out for a more comprehensive clinical examination. A number of these children have already been examined, and a report of the completed examination will be made at a later date. The full report of a case, made upon one of the blanks used in the investigation, illustrates the type of cases marked for further examination. In each individual case a social history taken from the records of the institution was drawn up, in greater detail for the cases marked for further examination.

RECORD OF THE EXAMINATION OF CASE 65.

Name, No. 65. *Sex*, Male. *C. A.*, 8–1. *S. A.*, 2A.
Date, May 3, 1919.

Form Board	*Cylinder*	*Memory Span*	*Miscellaneous*
1. 47″ Both hands. Space for block. 11 to 7.	1. 187″ Both hands. Trial and error. Levelness? Diameter? One obsrvational error.	4. 5 after 4.	Alertness Exercise. Very poor response.
2. 43″ Same method. No false moves.	2. 177″ Both hands. Levelness? Diameter?	Repeats 5.	
3. 47″ Trial and error, 4 to 5. Plan 1.	3. 92″ Fatigue. One observational error.		

Individual History

Date of Birth, March 26, 1911.
Place of Birth, Woodbine, N. J.
Health, Skin disease.
Early History.

Special Notes

Left down twice in same grade.

Family History

	Father	Mother
		Dead
Nationality.		
Race.		
Cause of Death.		Cancer.

Qualitative Performance

C. P., 3.3.
D. P., 3.3.
Fluctuation, 2.
Sensibility, ?
Co-ordination, 3.3.
Training, 3.
Retentiveness, 2.3.
Rate of discharge, 2.
Energy, 1.
Observation, 2.3.
Alertness, 2.

Remarks

Talks to himself during the entire performance. Shows specific defects in persistence and alertness of attention. Rate of discharge and energy low.

Special Action

Health Examination.
Further mental examination.

PROCEDURE.

The form used to record the findings was developed primarily for conciseness. It offers the opportunity for presenting on one side of a sheet of paper the data connected with the preliminary examination. For most of the cases it presents the one statement which will be made; only for the suspected cases will more data be gathered.

Certain of the oustanding specificities involved in the performance tests on which a qualitative estimate was to be given are found on the blank. Others were added as the individual cases warranted such additions. By C. P. and D. P. are meant contracted and distributed particularization, the concentration and distribution of attention. Fluctuation refers to the distractibility of attention, retentiveness and training to the memory complex, and co-ordination to muscular co-ordination.

The procedure followed in presenting the tests was in each case the standarized method of procedure outlined by the men who standardized them. Each child was examined separately under conditions which minimized the distracting influences.

TREATMENT OF RESULTS.

After the investigation was completed it was found impracticable to take the means of the age groups as had been done by Young, Paschal and Humpstone in the standardization of the tests with which the inquiry was originally started. The number of cases in each age group was so small as to make this unit of measurement absolutely valueless. I have therefore adopted the following method for the comparison of the quantitative performance of each individual with the result obtained in the standardizations. The results in each standardization are divided into quintiles. Each quintile group was given a certain value on the five-point scale. For the Witmer Form Board and the Cylinder Test the highest quintile was assigned a value of 1, the upper quintile a value of 2, the middle quintile 3, the lower 4, and the lowest a value of 5. The values for the Memory Span Test are reversed, the lowest quintile being assigned a value of 1, and the highest quintile a value of 5. The values 3, 4 and 5, taken together, represent, for each of the tests, the 60 per cent giving the best performance in the standardization of the tests. The performance of each child was compared with the performance time and level for his age group in the standardization for each test, and a value was assigned to his quantitative performance in that test, according to the quintile of the standardization in which his performance fell. These three values were then added and divided by three, the resulting figure representing what I call the mean level of the individual's performance. For example: Case No. 15 (Boys) takes 13 seconds to do the Witmer Form Board. His performance time falls into the second quintile with a rating of 4. The Cylinder Test is done in 37 seconds, falling into the third quintile with a rating of 3. His memory span is also in the third quintile with a rating of 3. Adding these three together and dividing by three we get a value of 3.3, the mean level for the three tests. It follows, therefore, that a perfect agreement on the quantitative side, between the selected and the unselected groups would require that 60 per cent of the children in the orphanage show a mean level of 3 and over. If such is the case, the performance of the selected group can be said to be on the same plane as the performance level of the unselected group in this series of tests.

The results in tabulated form show the age, school grade, actual performance time for the Form Board and Cylinders, the Memory Span, the performance estimate for each of these and the mean level of the results for boys and girls.

The cases chosen for further examination are marked by an asterisk.

CONCLUSIONS.

The qualitative judgments of the individual performances could not be subjected to a statistical study, but the judgment of the quality of the performance was made on a five-point scale.

1. The results of the investigation with the standardized tests show that 57 per cent of the boys and 52 per cent of the girls have a mean level of 3 and over. This means that the difference in the quantitative results between the selected group and the large unselected group is so small as to warrant the assumption that quantitatively, at least, the selected group, from a low social stratum, has as high a performance level as an unselected group.

TABLE I.—DISTRIBUTION OF MEAN LEVELS.

Value.	Boys.	Girls.
1-1.9	8	10
2-2.9	24	29
3-3.9	33	28
4-4.9	9	14
5.0	0	0
Total.......	7	81

2. The difference between the sexes is so slight as to be practically negligible.

TABLE II.—*Boys.*

Case No.	Age.	School Grade.	Performance Time (in secs.)		Memory Span.	Performance Estimate.			Mean Level.
	Yrs. Mos.		Formboard	Cylinders.					
1	15-7	2HS	19	58	5	1	1	1	1.0
7	16-4	7B	11	24	6	3	5	2	3.3
3	16-4	8b	18	105	6	1	1	2	1.3
4	16	S6a	13	44	8	3	1	4	2.6
5	15-9	1HS	14	47	7	3	1	3	2.3
6	15-6	7a	12	30	7	4	5	3	4.0
7	15-3	7b	13	32	7	4	5	3	4.0
8	15-1	2HS	19	35	7	1	4	3	2.6
9	15	7b	17	45	7	1	1	3	1.6
10	14-9	7b	10	32	7	5	5	3	4.3
11	14-7	8a	13	39	6	3	3	3	3.0
12	14-3	1HS	10	25	5	5	5	2	4.0
13	14-2	6b	18	69	5	1	1	2	1.3
14	13-11	7b	18	33	7	2	4	3	3.0
*15	13-9	7b	13	37	7	4	3	3	3.3
16	13-8	6a	16	61	7	3	1	3	2.3
17	13-8	1HS	11	44	6	5	2	3	3.3
*18	13-7	5a	15	45	3	3	2	1	2.0
*19	13-4	7a	18	55	6	2	1	3	2.6
*20	13-4	7b	17	44	7	3	2	4	3.0
21	13-4	7b	20	37	6	1	3	2	2.0
*22	13-4	5b	19	55	5	1	1	2	1.6
23	13-3	7a	16	32	6	3	4	3	3.3
24	13-2	6b	12	44	6	4	2	3	3.0
25	13-1	7b	17	37	7	2	3	3	2.6
26	13-1	8b	12	36	7	4	3	3	3.3
27	13	6a	15	44	7	3	2	4	3.0
28	12-11	7b	12	40	5	5	3	2	3.3
*29	12-10	5a	16	62	5	3	1	2	2.3
30	12-9	6a	13	36	5	4	4	2	3.3
31	12-8	5a	14	44	6	4	2	3	3.0
32	12-8	6a	14	20	5	4	5	2	3.6
33	12-3	7b	15	37	5	4	4	2	3.3
34	12-1	6a	14	35	7	4	4	4	4.0
35	12	6a	21	43	5	1	3	2	2.0
36	11-10	5b	16	66	5	3	1	2	2.0
37	11-9	5a	13	47	6	5	3	3	3.6
*38	11-9	4b	18	42	6	2	3	3	3.0
39	11-8	6a	15	52	5	4	2	3	3.0
40	11-1	4b	15	33	5	4	5	2	3.6
41	10-10	5b	16	48	7	3	3	4	3.3
*42	10-10	3b	32	66	6	1	1	3	1.6
*43	10-9	5a	16	40	5	3	4	3	3.3
*44	10-7	4a	18	47	5	3	4	4	3.3
45	10-7	5b	14	40	7	5	4	4	4.3
46	10-5	5a	17	46	6	3	4	3	3.3
47	10-4	3a	28	44	6	1	4	3	2.6
48	10-3	5a	27	40	5	1	4	3	2.6
49	10-1	14b	21	74	7	2	1	4	2.3
*50	10-1	4a	12	60	4	5	1	1	2.3
51	9-7	2b	20	55	4	3	3	2	2.6
52	9-5	3b	24	68	4	2	2	2	2.0
53	9-3	3a	16	35	5	5	5	3	3.3
54	9-2	4a	19	62	4	3	2	1	2.0
*55	9-2	3a	22	65	4	3	2	2	2.3
56	9	3a	20	47	4	3	4	2	3.0
57	9	1b	20	57	4	3	3	2	2.6
58	9	4a	23	83	5	2	1	3	2.0
59	8-9	3a	24	70	6	2	2	4	2.6
*60	8-6	2a	60	F	3	1	F	1	1.0
61	8-3	3b	23	75	5	3	2	4	3.0
62	8-3	3b	15	45	6	5	5	4	4.6
63	8-3	2b	20	61	5	4	3	4	3.6
*64	8-2	1b	22	56	5	3	3	4	3.3
*65	8-1	2a	43	92	4	1	1	2	1.3
66	8	3a	26	46	5	2	5	4	3.6
67	7-9	3a	16	75	5	5	3	4	4.0
68	7-2	1b	21	F	4	5	F	3	2.6
69	7	1b	26	90	5	3	2	4	3.0
70	6-11	1b	27	182	4	4	1	3	2.6
71	6-8	1b	25	72	4	4	4	3	3.6
72	6-6	1b	26	81	4	4	4	3	3.6
73	6-6	2a	26	90	5	4	4	4	4.0
74	6-3	1a	23	61	3	3	4	3	3.3

*Further examination. HS=High School.

TABLE III.—*Girls.*

Case No.	Age.	School Grade.	Performance Time (in secs.)		Memory Span.	Performance Estimate.			Mean Level.
	Yrs. Mos.		Formboard	Cylinders					
1	17-2	B. C.	16	35	7	1	3		2.3
*2	17-2	B. C.	11	37	4		2	1	2.0
3	17-1	C8a/18	11	30	6	1	4	3	3.3
*4	17-1	7b/18	16	66	5	1	1	2	1.3
5	16-10	2HS	10	35	7	4	3	3	3.3
6	16-10	2HS	13	38	6	3	2	2	2.3
7	16-10	C8a	12	34	5	3	3	1	2.3
8	16-9	2HS	11	40	7	3	2	4	3.0
9	16-9	C8b	15	39	6	2	2	2	1.6
10	16-8	C8a/19	14	45	5	2	1	1	1.3
11	16-7	B. C.	16	50	7	2	1	3	2.0
12	16-7	C8b/18	14	30	4	2	4	1	2.3
*13	16-5	1HS	18	57	5	1	1	1	1.0
14	16-3	C8b/19	16	42	6	1	2	2	1.3
15	16-3	1HS	15	30	6	1	4	2	2.3
16	16-1	C7b/19	15	28	6	1	4	2	2.3
17	15-10	C8b/18	19	37	6	1	2	3	2.0
18	15-9	1HS	10	32	5	4	3	2	3.0
19	15-9	6b	14	30	7	3	5	3	3.6
20	15-9	8a	13	33	7	4	5	3	4.0
21	15-8	1HS	8	33	7	5	5	3	4.3
22	15-7	C8b-18	17	87	5	2	1	2	2.3
23	15-5	1HS	13	40	5	4	3	2	3.0
*24	15-3	1HS	15	50	5	3	2	2	2.3
*25	15	6b	13	45	6	4	3	3	3.3
26	15	7b	18	52	6	1	2	3	2.0
*27	14-10	5b	16	43	5	3	3	2	2.6
28	14-9	1HS	11	45	8	5	3	4	4.0
29	14-7	1HS	13	38	5	4	4	2	3.3
*30	14-7	8a	16	30	4	3	5	1	3.0
31	14-6	7b	13	30	7	4	5	3	4.0
32	14-6	7b	13	41	5	4	3	2	3.0
33	14-5	2HS	11	49	5	5	2	2	3.0
34	14-	8a	13	39	5	4	4	2	3.3
35	14-1	7b	13	31	8	4	5	4	4.3
36	14-2	7b	11	35	6	5	5	3	4.3
37	13-9	7a	16	70	7	3	1	3	2.6
38	13-8	8b	9	31	5	5	5	2	4.0
39	13-6	7b	16	45	7	3	3	3	3 0
*40	13-11	7a	16	41	6	3	3	3	3.0
41	13	6a	26	46	7	1	3	3	2.3
42	13	6a	18	43	6	2	3	3	2.6
*43	13	6a	21	35	5	1	5	2	2.6
44	13	6b	16	41	6	3	3	3	3.0
45	12-11	7a	15	57	6	4	1	4	3.0
46	12-10	5b	18	68	5	3	1	2	2.0
47	12-10	6a	14	48	6	4	3	4	3.3
48	12-4	5b	19	50	7	2	2	4	2.6
49	12-3	4a	19	49	44	2	2	1	1.6
*50	12-2	4b	17	37	5	3	4	2	3.0
51	12-1	6b	15	44	7	4	3	4	3.6
*52	12-1	4b	15	39	5	4	4	2	3.3
53	12-1	7b	17	31	6	3	5	4	4.0
54	12-1	5b	18	40	6	3	4	4	3.6
55	12	7a	14	35	8	4	5	5	4.6
56	12	5a	16	76	5	4	1	2	2.3
57	11-10	7a	17	46	6	3	4	4	3.6
58	11-9	6b	14	34	6	5	5	4	4.6
59	11-7	6b	15	38	7	4	5	4	4.3
*60	11-2	5a	10	33	5	5	5	2	4.
61	11-2	5a	10	42	6	5	4	3	4.0
62	10-11	6b	15	48	7	5	3	4	4.0
63	10-10	5a	22	48	4	1	3	1	1.6
64	10-10	5a	19	54	6	3	3	3	2.3
65	10-9	5a	17	56	6	4	3	3	3.3
66	10-7	5b	22	44	5	1	4	3	2.6
67	10-3	4b	16	50	4	4	3	1	2.6
68	10	4a	27	87	7	1	1	4	2.0
69	10	4b	7	58	6	1	2	3	2.0
70	9-9	2b	22	55	4	2	3	2	2.3
*71	9-9	2a	27	90	5	1	1	3	1.6
72	9-7	5a	25	80	5	1	1	3	1.6
73	9-6	4a	27	62	5	1	2	3	2.0
74	9-5	3a	22	65	7	2	2	5	3.0
75	9	3a	21	87	4	3	1	2	2.0
*76	9	2b	27	80	6	1	1	4	2.0
77	8-9	2b	25	95	5	2	2	3	2.3
78	8-3	3a	21	92	5	4	2	2	3.0
79	8-3	2a	19	59	4	4	4	3	3.3
*80	8	2a	42	76	4	1	2	2	1.6
81	7-3	1b	28	82	6	3	3	5	3.6

B. C.=Business College. HS=High School. C=Completed. * Further examination.

3. As a result of this preliminary investigation 15 boys and 15 girls were marked for further examination. It is important to note, however, that the quantitative statement of results—as represented in the mean level—was found to be an unsafe criterion for choosing candidates for further examination. Twelve of the thirty children who are to receive a more comprehensive examination are rated, on the basis of the quantitative performance, in the highest 60 per cent, while many children who quantitatively fall into a low group gave qualitative performances which made unnecessary further examination. Actual contact with the child with the accompanying analytic diagnosis of the performance appears to be the only safe criterion for judgment even in such a preliminary survey, and it is only upon such a basis that a careful survey can be made. The finding is suggestive in the light of the use of the so-called "group intelligence tests" in eliminating from further examination groups of children in a school system or in an institution. There is developing a tendency for arbitrarily measuring school children—and granting or witholding certain educational privileges—on the basis of quantitative results of group tests. The method is quicker than that used in this investigation, but hardly as scientific.

A number of subsidiary facts came out as a result of the examination of this special group:

1. The general school retardation here seems to be the result not of a general low level of mentality, but of certain external conditions. The children in an orphanage are drawn from a class where early schooling is neglected for one reason or another. Quarantine of an entire institution because of scalp and other contagious diseases interferes with schooling and results in a general retardation.

2. In the performance of certain of the tests the older children gave a comparatively lower grade of performance than the younger children. This was especially true of the Cylinder Test, and was more especially characteristic of the girls' performance in this test. A competency very much involved in the performance of this test is alertness of attention, and it seems that the older children, who have been longer exposed to institutional influences, are least efficient in the exercise of this competency. With the enforced routine of institutional life there is less need for employing this competency, and efficiency in its application is therefore lost.

The final result of the completed examination of the suspected cases will be reported at a later date.

DIAGNOSTIC TEACHING.

A Case of Infantile Stammer Resulting in Apparent Imbecility.

BY FRANCES Q. HOLSOPPLE, M.A.,

Graduate Student, University of Pennsylvania.

The "attempt to teach" perfects the diagnosis and begins the remedial educational treatment. Its value was demonstrated in the case of George, an eight-year-old boy originally brought to the clinic for speech training. A social agency interested in the family wanted to know whether anything could be done for him. The report stated that he had always been slightly deaf, and that he had become entirely deaf in one ear following a mastoid operation. The degree of deafness has not been satisfactorily determined, as a long series of experiments with words and other sounds seems to indicate that the deafness is largely central. Apparently his ability to hear the tick of a watch is more nearly normal than his ability to hear words. At first it was sometimes necessary to speak to him in a raised voice in order to secure his attention, but now he responds to a normal or even a lowered tone.

When George first came to the clinic, he had an extremely bad infantile stammer. He was unable to articulate a single word that anyone but his mother could understand. There were no traces of anything learned during the two years he had been in school. His reactions were infantile and showed how much he depended upon his mother as his interpreter. The failure to use the muscles of his mouth had produced a vacant expression. Nothing else in his appearance or manner suggested qualitative feeblemindedness. He is a sturdy, red-haired boy with plenty of energy.

George was accepted for training after an examination in which he tried with some success to imitate the examiner's lip movements in sounding long *e* and final *t*. He learned to pronounce *eat* and *meat* intelligibly at once. The trainability discovered by this attempt to teach was apparently his only normal ability. He did the formboard and cylinders poorly and was of course unable to do any parts of the Binet tests for which language was required. An attempt to test his memory span showed that his articulation was so bad that he responded to a series of three or of four digits with three indistinguishable sounds. From any evidence except the attempt to teach, he would have been diagnosed as feebleminded.

From the last of January to the first of April, George was taught in the clinic for half an hour each week. It took several periods to teach him the articulation of the final consonant in such a sentence as "I eat meat." He improved rapidly, however, learning to pronounce all final consonants, and to differentiate *t* and *k* even when both occurred in the same monosyllable. His sounding of the sibilant was a real triumph, as all the front teeth had just been extracted, and he was obliged to invent a tongue position as a substitute. So much progress would have been impossible without the intelligent co operation of his mother, who drilled him at home on the words he learned in each lesson.

As soon as the initial *c* was learned, words like *cocoa, coffee* and *cake* were easy. *Eyes, ears* and *nose* were the first in which he learned to sound final *s*. George was very careful to enunciate *yes* distinctly, but he had a great deal of trouble for a few weeks in remembering when to say *no* and *nose*. *Tea, time,* and such difficult combinations as *some time* and *thank you* were practiced next. After two months training, he still made mistakes with the complex consonants in *candy* and *drink*.

At the end of the first eight weeks, it was decided to reinforce the auditory and kinaesthetic images with the visual. George came to the teaching clinic one afternoon each week, in addition to the speech clinic. The first attempts to determine his proficiency in reading and spelling showed that he had received very little benefit from his work in school. When he was given a box of anagrams, he spelled his name correctly in capital letters, running the first and last names together. He also picked out the words "Frank" and "doy," reading the latter "boy." He knew the names of the following letters, A, C, M, T, E, F, R, L. He had no idea of sounding them.

The teacher started at once with phonics to teach simple words containing sounds which he pronounced most clearly. George learned individual sounds fairly well, but was very slow to pronounce new words as wholes. In four weeks he could spell and sound the following words: *Dog, Ran, Boy, Cat, Hat, Fat, Rat, Bat, Ball, See, Stop, run, now, get, can,* and he was able to begin the Haliburton Primer and proceed normally.

Since beginning the primer George's interest has increased, if any increase was possible. He is inordinately proud of his ability to read. Between May 1st and May 15th he has learned to read, spell, and sound all words in the first eight pages of the Haliburton Primer. The teacher is making an especial effort to overcome the tendency to monotone in reading connected sentences. He imitates various inflections well, and is gradually overcoming this. The improvement in articulation is evident from his ability to pronounce distinctly such a word as "pitch."

It has been interesting to notice the improvement in the boy's ability to discriminate auditory sensations, as the kinaesthetic images have been built up. The more he can talk, the more he can hear. As he has begun to differentiate auditory stimuli, his ability to particularize and to distribute attention has become apparent. By the time he could articulate the numerals intelligibly, he was able to reproduce a series of five digits.

Although George is certainly no lower than border-line mentality, no one performance gave an indication of his capabilities. In his case the threshold of sensibility was so high and motibility so ineffective, that an ordinary stimulus failed to produce reaction. The slight deafness, probably in combination with lowered vitality, had cut him off from the outside world. His condition resembled that of the "idiot by deprivation" in the narrowing of range of interests. His ability to give definite particularization was so poor that even the manual performance tests were affected. On the other hand, as soon as he began to react to the clinic teaching, interest, attention, and alertness were stimulated to the modification of his whole behavior.

The work with this boy shows how successfully the attempt to teach may supplement the results of the tests. It is not necessary to hear George read in order to appreciate the progress he has made. He is different in manner and appearance. The use of the correct lip positions has removed the vacant expression. He makes fairly successful efforts with words which he has never had in his lessons, and the consciousness that he can make himself understood has made him more self-reliant. Since he is not so dependent upon his mother he has begun to play with other children. If he attends the clinic lessons during the six weeks, summer term, he may even enter the second grade in the fall. This could never have been predicted without the attempt to teach, for in his case the teaching furnished the basis for the prognosis.

DIAGNOSTIC TEACHING

A Question of Imagery.

By Helen R. Squier, B. S.

Graduate Student, U. of P.

Gideon is a boy of eleven in the fourth grade. He was brought to the Psychological Clinic by his mother's recommendation on account of his "nerves." He displays a slight distractability of attention and a desire to "figit," or toy with something with his hands a great deal, but these symptoms are no more serious in Gideon than they are in a large number of preadolescent boys.

In the course of his clinical examination, it was found that he had fourth-grade proficiency in reading, and that he enjoys reading such books as the "Arabian Nights" for his own amusement. He passed the ten-year reading and reproduction test with one memory to spare, so that he remembers fairly well what he reads. He is a trifle slow in his arithmetic, but he has a sufficiently good arithmetical sense to know when to add, subtract, multiply, and divide. He has not memorized all his addition and subtraction combinations, but he can get them fairly quickly, and he knows all his multiplication tables perfectly. He was a trifle slow with the performance of the "intelligence" tests in the laboratory, and he failed in his first performance with the Witmer Cylinder Test. But it is probable that he would have been classed as a normal, somewhat stupid and somewhat nervous boy, had it not been for his performance with the Design Blocks. This fell so far below his other performances and was so very unlike the performance one might be led to expect from a boy of Gideon's type that it raised an interesting question in the mind of the examiner in regard to his mental imagery. How had Gideon learned to read with fourth-grade proficiency, when he had such serious trouble with such a simple problem as the making of a design from four design blocks? It was to find the answer to this question, that the examiner recommended George for clinic teaching and the resultant analytical diagnosis.

It became my business, as clinic teacher, to make a special study of Gideon's performance with the design blocks in particular and of his mental imagery in general.

The first time Gideon worked with the design blocks, he was shown the model of a single chevron and asked to copy it. He worked for two minutes and forty-five seconds and finally stopped with it all wrong. At last he got it half right and then asked the examiner if it was all right. When he was told to look and see, he at once set to work again and finally got the chevron design. But when his blocks were disarranged and he was told to try again, he was no more successful, and his performance was no better than in his first trial. He was made to copy the chevron three times, but even then he could not reproduce it from memory.

It was just a month after this that I began the task of systematically trying to teach Gideon to make the chevron design out of four blocks from memory. I reminded him of his work with the design blocks and the chevron, and called his attention to the fact that the chevron is just exactly like the wound and service stripes the boys wear on their sleeves when they come back from Europe. He seemed to understand the instructions well and set to work with the four blocks I gave him. The result, which he held up proudly for inspection, was a yellow square in a blue background with one angle of the square pointing toward him. When I asked him if that was right, he set to work again, but this time he did not even succeed in getting a yellow figure. When he stopped working, apparently satisfied with his performance, the top two blocks presented a yellow triangle bounded by blue and the two lower blocks a blue triangle bounded by yellow. He tried many different arrangements but could not seem to hit upon the chevron. He was allowed, finally, to copy a model, which he succeeded in doing after a great deal of trial and error. But he still could not reproduce the chevron from memory. I asked him to draw a picture of the design for me, and he readily drew an angle of about forty-five degrees, in double lines, with legs about the length of the sides of the chevron formed by the design blocks. With this drawing before him, he was finally able to form the chevron out of the blocks.

And now one point at least was established: He did have a sufficiently clear visual image of the chevron to carry it over to his kinesthetic sense and thereby to represent the size and shape of the chevron, roughly at least, with paper and pencil. It might be that his visual image was strong enough to serve as a guide for him, provided there was no conflicting picture before him, and not sufficiently strong to stand out when the design blocks were in other and possibly distracting designs before him. But I could not be sure of this point until I had investigated further.

I gave him a double chevron composed of eight blocks to copy from a model of eight blocks just like his. It was when he showed himself absolutely at a loss here that I began to divine to a small extent what his trouble was. He was working with the image of the whole figure in his mind and had not displayed enough contracted particularization to analyze the figure into the component parts. He went on putting block after block into his design in incorrect positions because he did not match his work with the model, block for block. His idea was simply to go on working and moving the blocks about until he hit upon the figure of the model—a plan which had some chance of success as long as he had only four blocks to work with, but which was hopelessly impracticable when the number of his blocks was increased to eight.

It was evident that he needed training in method. So I showed him a simple design of sixteen blocks on the lid of the box, calling his attention especially to the fact that he must be very careful to match each of the blocks that composed the figure with one of his blocks. I insisted upon his having each block in the correct position before he went on to the next one, and I saw that he was learning to analyze his figure. He succeeded in putting the second eight blocks away in about half the time it took him to put away the first eight, with about half as many mismoves.

And now another point was established: A part of his difficulty lay in his lack of familiarity with his tools. He had not gone to kindergarten, and, if his own statement is correct, he has no toys of any kind at home. This, however, could not account for the major part of his difficulty. Surely a boy of eleven should be able to learn the secrets of four simple design blocks at one short sitting.

The next week Gideon was still unable to put together the single chevron from memory, though he could draw it again before he had been allowed to see it and put it together with his model before him. Now he was really interested in the problem for its own sake, and, after he had painfully and with much detailed instruction and correction fashioned the double chevron from a model, he was anxious to go on making chevrons. So I suggested that he copy the third chevron from the first, and he finally managed to do this, though he would continually stop with the design incorrect and ask me if it was right. I always told him to look and see, but he never stopped asking me. Now he was beginning to form a zigzag yellow path in a sea of blue. Many times he made wrong moves which he could not seem to correct with his eyes. But at every critical turn in the figure, he stopped to trace the yellow path with his finger, seeming to get a significance in the regular turns and angles of the figure with his finger kinesthesia that he could not get with his eyes.

This suggested to my mind at least two points in a working hypothesis, if not two points in my conclusion. His kinesthetic sensations, images, and memories, were better than his visual ones. And yet it might be that a large part of his trouble lay in the kinesthesia of the muscles of his eyes. He could get simple color sensations, but it was the angles and turns of the chevron figure that troubled him most. His most frequent mistake in the formation of the figure and the mistake which he invariably made the first time I asked him to form the chevron each day was the formation of the yellow square in a blue background instead of the chevron figure. He turned the wrong side of his yellow triangles on his two lower blocks to meet the yellow of the upper blocks. Yet very frequently, after this mistake had been pointed out, he placed a blue side of one of his lower blocks against the yellow of the upper block. This was an error in color as well as in position.

Now I decided that I could not establish this point without a knowledge of his imagery in general. So far as the chevron performance was concerned, three or four possible hypotheses, in addition to the one mentioned above, entered my mind:

1. He might be suffering from a visual amnesia, which manifested itself particularly in connection with the chevron, because so much stress had been laid upon that figure. He might be exhibiting stage fright.

2. There might be a lack in his visual kinesis. It might be impossible for his eyes to initiate movements.

3. It might be (*a*) that he was unable to hold a sustained visual image, or (*b*) that he was unable to coordinate images from different sense realms or form complex images from his simple ones.

4. It might be that he had such a clear and distinct image of the chevron as a whole that he was unable to break it up into its component parts—he might have too strong a visual image.

My first investigation of his imagery was with the memory span experiment. With the auditory presentation the clinical examiner had found that he was able to reproduce five digits, but that it seemed impossible for him to get six. With the series 284739, he left out the 8 on four successive repetitions. Then he got all the digits, including the 8, but said the 8 out of place. Again he got all the digits but not in their right order. Then he got the other digits all right, omitting 8. I felt that this particular difficulty with the 8 might or might not be significant.

In my own investigation of his memory span, I found that he had, with the auditory presentation, a memory span of five and that he could get six digits on two repetitions. But he could not get seven digits on ten repetitions. With the combined visual and vocal presentation—when he read the numbers aloud from a card which I held before his eyes—he failed to give the five digits of the first stimulus number until the second repetition, but he succeeded in giving the five digits on the first presentation of the second stimulus number. This was barely a memory span of five, when he had shown an unquestionable five with the auditory presentation. The strange part of this performance was that he gave five easily with the visual presentation when he did not read the numbers aloud. I noticed that his lips moved as he read the digits, but he made no sound. He was able to reproduce not only five digits but six with the visual presentation. His method, however, made it possible for him to do this by using a span of only four. The stimulus series was 628195, which he reproduced as "six, twenty-eight, one, ninety-five." By this grouping, which he hit upon quite without assistance, he was able to reproduce as many as eight digits on two repetitions, complicating his problem and learning one more than his real span of five in two repetitions. Here the series to be reproduced was 83157294. which he gave as "eight, three, one, five, seventy-two, ninety-four."

His performance with the Binet language tests showed no lack of simple verbal imagery. He acquitted himself well in the nine-year rhyming test, and his ten-year "60-word" free association test displayed nothing unusual. He started out by naming the objects in the room, got outside the room on some legitimate association and showed natural and good classification in his method of naming all the animals he could think of together and of naming common fruits and vegetables in groups. He passed the test easily and never seemed to have to stop for a word. In spite of this wealth of language, however, he was unable to pass the twelve-year dissected sentences tests or to succeed with them at all. I was not trying to get his I. Q., so that I could take the liberty of varying the procedure of the tests as I pleased. I let him have a pencil for the dissected sentences, and he proceeded with the test very systematically by crossing out each word in the first sentence as he used it in the sentence he was forming. He worked for a full minute on the first sentence, but all he could make of it was, "for We start early at the hour." His second sentence read,"My teacher asked to correct my paper I." He professed an inability to do the third.

He enjoyed working with the Healy Completion Test, but was not especially good at it. He put the bird in the place of the little girl's hat, and put the hat above the bird cage. He changed this when I questioned him about it and put the basket of apples above the bird cage. When I asked him what the boy in the tree was doing, eh answered, "Dropping apples into the basket." When I suggested that that was impossible when the basket was higher up than the boy, he put the basket in the correct position.

He succeeded in making an acceptable copy of the diamond in the VII-year Binet tests, making his copy somewhat larger than the original. He fell short of passing the 10-year design copying test, however, getting only half a credit for each design. He drew lines to only three corners in Design B, drew one line from the corner of the inner oblong to the side of the outer one and put in one extra line from the side of the inner oblong to the side of the outer one. He left out the center portion of Design A, and extended both of the upper square formations of this design in the same direction.

This performance with Design A especially suggested a possible difficulty with direction in his visual perception—a suggestion which was materially strengthened by his performance with the Knox Diagonal and Triangle tests. About one-third of his attempts to fit pieces into these tests resulted in a confusion of the direction of the angles, as though he had a kind of mirror perception. In the diagonal he was always able to correct this at suggestion, but in the triangle it was this tendency more than anything else that caused him to become hopelessly confused and finally to give up the test altogether. His planfulness in the test, however, accounted in part for his failure. He succeeded in forming the rectangle correctly and then dumped the triangles forming the rectangle out on the table again when he had difficulty with the triangle.

His lack of planfulness came out in connection with the Binet Ball and Field Test, when his demonstration of a path for finding the ball would have been classed as an eight-year level inferior plan at best. It was well substantiated by his performance with Healy A. The first time he saw this test he was able to solve it in three minutes and twenty seconds which time he subsequently reduced to twenty seconds in two additional performances. When he was shown the test about two weeks later he failed to solve it without instruction, He succeeded in getting the longest piece in place and then placed the next longest parallel and in juxtaposition to this first piece, with the result that he had a small empty space at the end of this second block that none of his pieces could fill. He went right on trying to force the other pieces into place, with the result that he could accomplish nothing. He struggled with the thing for a while, and then I told him that every bit of space would have to be filled and that when he found that a piece did not fit as he had it first, he should try it at right angles to the original position. He carried out this suggestion and was able to give a much improved performance.

That he is easily confused in his imagery is shown by his answers to the first of the Binet Problems of Fact. He saw a man hanging from the tree in the park, but when I asked him how the man got there, he answered that he was killed by a bear. When I asked him how he could be killed by a bear if he was hanging from a tree, he said, "No, a monkey."

"You mean that the monkey was hanging from the tree, or that the man was killed by the monkey?" I asked.

"The man was killed by the monkey," he answered.

In answer to the question concerning the man "walking sitting down," he said first that the man was riding a horse. When I suggested that the man would not be walking if he was riding a horse, he was at a loss. I moved my feet up and down in the suggested manner, to see if that would arouse an image in his mind, but that evidently suggested nothing to him. But when he obeyed my suggestion to move his own feet up and down as if he were walking, he answered, "Oh, a bicycle!"

One of the most peculiar aspects of the whole investigation of this case is the fact that the boy could not give six digits on any number of repetitions, apparently, in his examination, and yet could give six on the second repetition, and apparently use this ability to good advantage a month later. The fact that his difficulty with the reproduction of six digits the first time he was tested centered consistently around one particular digit can, in view of his later performances, have only one explanation. There was some actual counter-suggestion at work here. He had gotten the idea into his head that he could not get the digit eight, and so he was never able to get that digit. The fact that 8 was the second digit in the series makes it very unlikely that it was the most natural number for him to forget because of its position in the series. Children are much more likely to have difficulty with one of the later numbers than with one of the first numbers.

His difficulty with the reproduction of five digits with the voco-visual presentation can be very easily explained by a defect in his distribution of attention. He was trying to get a visual image of the numbers, to read them correctly and to remember them all at once, and it was impossible for him to distribute his attention successfully over all these things at once. The image was just a little too complex when all of it was called definitely to his attention. He was able to make the transfer from the visual image to the voco-motor image when he did not read aloud, because this transfer was habitual and automatic and did not require his attention. The fact that he moved his lips constantly suggests that his image of the number before he reproduced it was voco-motor rather than visual. Each number was in the visual field just long enough for him to get a sufficiently clear perception of it to form a voco-motor image. His visual image pure and simple, therefore, was not tested here.

His performance with the Binet Design A, and with the Knox tests made me feel sure that at least a part of his trouble lay in the kinesthesia of his eye muscles—despite the fact that his ability to draw the chevron which he could not reproduce with the blocks—and in a suggestion of mirror perception. This last hypothesis is supported by an incident in connection with the chevron figure itself.

On the second day of my work with him, he had evidently learned to place the two upper blocks together correctly, but invariably he formed them upside down and then reversed their position. He could not reproduce the two lower blocks from memory. He had two images in his mind therefore: the image of the two top chevrons, inverted, and the image of the complete figure. He could get this last image only by an imperfectly applied trial and error method, and the images on the blocks before him could sometimes confuse his memorial image of the appearance of the figure. On the third day of my work with him, he produced, when he tried the chevron, two yellow triangles one of which he placed on the top of the other. He had been able to carry over for a week the image of the apex of the chevron, and when he had tried to recall the image of the two lower blocks, the first image had simply been repeated. It was only when his drawing of the chevron or an actual-chevron was before him, that he could keep in mind the definite direction of the yellow path formed by the chevron. Without either of these two aids, he turned the block over and around in a haphazard, lost fashion, until I reminded him that the only way to succeed was to keep turning the block one side at a time in the same direction until he produced the desired figure. He was able to do this easily with the fourth block, but he had most difficulty with the third, because a three-quarter image of the chevron had not stayed in his mind, and he could not analyze his complete image sufficiently well to know how one leg of the chevron should look before the other was formed.

Later in the day, it was evident that he was proceeding about the problem with a change in his imagery. When I asked him to put the chevron together, he placed the two top blocks together correctly and then joined the two lower blocks and fitted them to the top blocks in such a way that the blue of each of his lower blocks touched the yellow of his upper blocks. Then I understood what had been troubling him for sometime. He had an inverted perception of the two lower blocks just as he had had an inverted perception of the two upper blocks for awhile. I recalled the way in which he had fitted blue to yellow the first day I worked with him, and discovered that this was not a confusion in regard to color or form, but rather an inverted image, which I had managed to rid him of, without putting any other image in its place.

And now, at last, I felt that I knew something of his imagery in general and his difficulty with the chevron design in particular:

1. He was handicapped by his lack of familiarity with the material with which he was required to work.

2. His visual images were frequently inverted, and he suffered from weak kinesthesia of the muscles of the eye, with the result that he could not be sure of his angles in such a figure as the chevron, and his visual image of such a figure was necessarily blurred.

3. This weakness of his kinesthesia was confined to the muscles of the eyes alone. His general kinesthetic imagery was good, as was evidenced by the fact that he could find errors in the chevron figure by tracing the lines of the figure with his fingers and by the fact that his kinesthetic imagery gave him the solution to the Binet question of the "man who walks sitting down." He was able to draw the chevron when he could not form it with the blocks with the help of this strong kinesthesia.

4. His distribution of attention and his contracted particularization are defective, though these may be improved with maturity and training. He is unable to analyze a whole into its component parts, and he is unable to synthetize a number of parts into a complete whole.

5. His planfulness is defective. His simple images may be quite clear, but he is frequently unable to shape them into meaningful complex figures and to proceed definitely by their guidance to the solution of a problem.

6. He is somewhat suggestible, so that it is possible to increase the difficulty of a task for him by making him believe that he cannot succeed in it.

It was all of these defects together, rather than any particular one, which made the formation of the chevron difficult for Gideon. Even with his inverted images, he would have been able to succeed with the test had he had the power of analyzing the situation, or of formulating a good plan by which to solve the problem. He would probably have been able to work with a higher competency had he not had the feeling that that particular task was difficult for him, and so diverted his own attention.

He will never be able to distinguish himself in the world, but it is probable that, with a careful training of his methods of thinking and his planfulness, he will be able to hold his own among his fellows and to be self-supporting. His ambition at present is to become a wagon driver or a deliveryman, and there is no reason why he should not make a good one, since this occupation does not require work with mechanical tools of any kind or intellectual ability of a very high order. He has enough judgment and common sense to get along in the world.

DIAGNOSTIC TEACHING

A Case of Deficient Retentiveness.

BY REBECCA L. LEAMING,

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Saul came to the clinic for examination the first time on February 1, 1919. The diagnosis given at that time by Dr. Humpstone was "Five years retardation but not qualitatively feebleminded." The recommendation given was "Special training and diagnostic teaching at the Psychological Clinic."

Saul is thirteen years and very small for his age. His face is small and looks rather old. He has a constant worried expression as if he were trying to fathom some deep problem. He reported that he got a hundred every day in arithmetic in school, but that he could not do spelling and reading at all. He said that he had missed a lot of school in moving about from place to place, and that he was always put down when he changed schools. He said also that when he went back after being out he "Felt like a dummy and never caught up to the rest of the children." At the time of his examination he was in the second grade.

I made my first attack with Saul's memory span. I found it to be six definitely, but I also found much to my surprise that I could not get him to give seven even with an unlimited number of repetitions. I then tried him out with number work and found that he had a good idea of large and small numbers, counting, and number combinations. He knew his tables up to seven and said that they were learning the eight times table in school at that time. He could add, subtract, multiply and divide with a fair amount of accuracy, and on the whole I would say he had full second grade, if not more, proficiency in arithmetic.

I next turned to his spelling and here I encountered difficulty right away. I gave him a list of five five-lettered words to study just as long as he wanted so as to know them well enough to spell them correctly for me at the end of the time. At the end of six minutes he said that he knew them. I asked him to spell them and found that he had no idea at all of how to spell any one of them. He would give ridiculous combinations of letters. Often there would not be one of the right letters in the word present in the combination that he would give.

I next tried out his reading, and here I found several things. First of all he recognized all of the letters and would spell out the words to himself as he went along. Second, the letters conveyed no sound idea whatever. He would spell out a word and then give it a quite absurd name. The sounds of the letters did not influence him in giving the word its name any more than if they had not been there. Third, he would look at the pictures in the book, get an idea of the story from the two or three words that he got with my help, and then he would proceed to make up a story and read any words that came to his mind regardless of whether they were in the book or not.

I next tried giving him a thorough drill on three of the small words in the lesson, having him spell the word, pronounce it, find it in the lesson, build it with the Pittsburgh word-builder and write it on the board. Then I gave him some alertness exercises for a few minutes, to waken him up and to determine his ability in this line. He knew his right and left hand and followed the exercises and commands very well. Then I turned back to the words that I had drilled on and found that they were absolutely strange to him. He might just as well never have seen them before. This led me to believe that one of his chief defects and reasons for retardation was a very poor retentiveness. I tried him out on several other things and found this to be true.

This completed my exploration examination. Having read over the case history and the results of his examination in the clinic very carefully I determined to spend my clinical teaching periods with Saul in trying to determine how much progress he was capable of making with his reading and spelling. I decided to leave arithmetic alone, for he was so much ahead of his reading and spelling in that branch. Saul wrote legibly and with a fair degree of efficiency so I decided not to work with his writing.

Since I had discovered that the letters meant nothing to Saul as far as sound went I first of all gave him a good drill in phonetics. This was absolutely new work to him, and he liked it very much. He seemed to take great delight in sounding out the combinations and words. After I had given him about thirty minutes of drill, I took Book I of the "For the Children's Hour" series and had him read the first story which happened to be the story of "Chicken Little." I chose this particular book because it has a great deal of repetition in it, and it enables Saul to become familiar with the words by seeing them again and again, especially in the same sentences. He did much better as a result of the phonetic drill he had had. The improvement was remarkable. He still spelled out the words and often read words that were not on the page at all, but he made a very real and earnest attempt to sound out the words, and although he often got very curious results from his attempts still he got quite a few words correctly from his sounding out process. He wanted to read on and on and was much disgusted when I made him stop and turned to spelling. First, I asked him to pick out five of the words in the lesson that he had not known until he read the lesson. He chose them and then I asked him to study how they were spelled and sounded from the book and then to close the book and make them for me with the Pittsburgh word-builder. He made three errors in all but they were not the wild and foolish type of errors that he had made before. He spelled chicken "Chickin" and leaves "leavs." But on the whole he showed that he had some idea of the sound of the words in relation to their spelling. I was anxious to see whether Saul would retain these words until the next week when we had our lesson. I found to my surprise that he remembered them fairly well. He still spelled chicken "Chickin," leaves "leavs," and rabbit "rabit" as he had done on the first day. But he got the other two words correct and when I told him that there was something the matter with the three words he corrected them himself without any assistance from me. Later I had him make with the Pittsburgh word-builder sentences about what he had read, and he did this very well. For example—one day he read the story of "Little Half-Chick," and when I asked him to write some sentences about the story for me he made the following with the letters on the table:

"Little Half Chick went in the woods."
"Little Half Chick went to the king."
"He would not help him out of the brook."

When I looked at his sentences the first time he had "wood" for would. I told him that was not right. Then explained to him what a "wood" was and asked him if he meant that. He said no, that he meant like "I would help you if you wanted me to." Then I told him how to spell it and he corrected his sentence.

Altogether I had Saul for eight lessons of approximately two hours each. On two of these occasions I had another child with him and could not give him my whole attention. Each time I tried to follow a kind of schedule. As a rule I followed this order of work with him: Phonetic drill—Reading (while the phonetic plan was still fresh in his mind). Alertness and Breathing Exercises—Short Arithmetic Drill in number perception—throwing out large and small numbers of colored straws and getting him to tell me how many I threw out each time. Reading again—Spelling (orally, written and with the Pittsburg word-builder). Sentences about the reading lesson of the week before and of the reading lesson of the day—and finally reading again.

Saul certainly made progress in the short time that I had him. When he first came to me he could not read at all—he had not efficiency in reading. At the end of eight lessons he had not acquired proficiency in reading but he had acquired a certain degree of efficiency and I am convinced that with practice under careful supervision, in order that he may be broken of his bad habits of spelling the words out each time and reading words that make the story sound well but which are not on the page, Saul can acquire proficiency in reading. With his spelling, more drill is necessary on making him see that letters have sounds and that the word is the summation of the sounds of the letters. Also that he can discover in a large measure how to spell words by sounding out the words and then using the letters that have those sounds. I am not sure that there is not some other specific defect that works against Saul in his spelling, but in the time that I had him I was unable to analyze out any one defect apart from his extremely poor retentiveness that would hinder him from learning to spell with a fair degree of efficiency.

After working with Saul for eight weeks I am convinced that the original diagnosis is corect—he is not qualitatively feebleminded but is very much retarded. This retardation mav be due to many causes, some of which may be: poor home environment, lack of proper care and nutrition, constant moving from one school to another, lack of any real foundation of the fundemental operations in the three R's and an attempt to pile up knowledge on a foundation which is not there, specific mental defects (one of which is his poor retentiveness and perhaps others which did not manifest themselves in the short time I worked with him). All of these things may have had a part in his retardation.

Saul gave promise of being able to make a good amount of progress, and one was encouraged to go on working with him. He had good persistent attention, energy enough to see him through when he was interested. He had good planfulness, and his ideas always appeared to be a step or two ahead of the game. He would lapse into a kind of absentness or vacancy when he was not interested, but this did not happen often. He insisted that he liked to learn and said that he would rather come to the clinic to be taught than to play, but that he hated to go to school for they "made him feel like a dummy and treated him rough"—the exact meaning of which I was never able to discover.

DIAGNOSTIC TEACHING.

A Case of Mental Deficiency and Doubtful Social Competency

By L. Doris Wilcox,
Senior, School of Education, U. of P.

Two years ago John was brought to the Psychological Clinic for examination because of suspected feeblemindedness. He was at that time seven years old and in the first grade of school where he had been doing very poor work for nearly two years. His absences were few, and his conduct was reported by his mother and teacher to be good. He played with other children of his own age, and "got along" very well with them.

There was nothing significant about the birth or family history. His health was fair. He was nervous and could not sit still, and trembled easily. He had never suffered from convulsions or any serious accidents. He had had his tonsils and adenoids removed, but had undergone no other operations. Before he was five years old he had had measles, diphtheria, scarlet fever and whooping cough. The child appeared fairly well grown and normally developed. He had no marked somatic stigmata.

The psychological examination proved inconclusive. His performance tests were poor, yet not poor enough to warrant a diagnosis of feeblemindedness. His minimum time from three trials on the Witmer Formboard was 33 seconds. (Experiments have shown that most normal children of his age do it in about 25 seconds.) He failed on the Cylinder Test, but the failure was not a bad one. He was able to copy correctly one of three simple designs made with four colored blocks, and he compared five weights accurately.

The informational tests were not conclusive because the child was only seven years old and only in the first grade, and the examiner could only guess at the previous training and environment. The fact that John had been nearly two years in the first grade was not particularly significant. That may have been the fault of the school, or may have been due to the boy's inability to adjust himself to the ways of the schoolroom.

By spelling out the words, he read with difficulty from the Aldine Primer, "Sing, girls, this is my." "Come again some other day," he read. "See the boy and girl."

When asked, "What's the thing to do if it is raining when you start to school?" he answered, "Take an umbrella." "What's the thing to do if you find that your house is on fire?" "Tell the fireman." "What's the thing to do if you are going some place and miss your car?" "Wait."

According to the Binet-Simon Tests he scored 5 years 6 months with an I. Q. of 76.7. If the alternate of "morning or afternoon" in the 6-year tests had been given in place of the mutilated pictures, he would have scored 6 years and 4 months, and an I. Q. of 88.4.

The examiner realizing that the results were insufficient upon which to base a scientific diagnosis, deferred a statement of John's mental status, and suggested that he return to the clinic in the course of a year for further examination.

John returned to the clinic this spring. He is now nine years old and in the second grade. His aunt, who brought him, says he is a good boy, does errands well and helps his mother around the house. He plays with children younger than he is. He is fairly healthy. The only trouble with him—according to his aunt—is that he's "dull in school."

Accordingly, I combined with the re-examination an attempt to teach. John has now been to the clinic four times, remaining about an hour each time.

I began with the Formboard, first as a test, then as didactic material. John did not remember having seen it before. His first performance took thirty-nine seconds. His movements were jerky and ill-coördinated. He made four errors but corrected them. His second performance was somewhat improved. He made only two errors and finished successfully in thirty seconds. Then I replaced the blocks, using both hands, and calling attention to the position of the ones he found difficult—the star and the cross. John tried a third time, and reduced his record to twenty seconds. With practice and instruction on following days, he has learned to complete the performance correctly in nineteen seconds with no errors.

He failed on the Cylinder Test the first time I gave it to him. He placed the cylinders in any holes where they would go and made no attempt at correction. After five minutes he gave up, saying, "There's one over." I then removed the cylinders and showed him how to perform the test, calling his attention to the way the blocks fit. Then I removed them and told him to replace them. The child took up one cylinder and tried it in many holes until he found where it belonged. Using this method throughout he completed the performance in ninety seconds. Then I called his attention to the plan of the apparatus, showed him where the long holes were and where the short holes were. He tried again and reduced his time to eighty-six seconds. He made fewer errors than before. He has practiced six times on the cylinder since, and can do it now correctly in eighty seconds with perhaps only six false moves.

He was able to copy quickly and easily a square made with four design blocks. But once, when it was necessary for me to leave him alone for a few minutes, I told him to copy with his blocks a printed pattern (which required sixteen blocks.) When I returned, fifteen minutes later, he was working futilely, trying to do it with four blocks. When I suggested using all his blocks, he set to work and completed the design in two minutes and forty seconds.

One day he made two rows each containing five blocks. He told me there were ten altogether. But when I asked, "How many are five times two?" he answered "twelve."

According to him at that time, $4\times3=6$, $5\times3=15$, $4\times3=9$, $3\times3=6$, $2\times3=8$, $2\times4=12$.

Realizing that I had aimed too high, I began with simple addition. I found that he could count up to twelve. He knew $1+1=2$, $2+1=3$, $3+1=4$, $4+1=5$, $5+1=6$. With blocks he found that $6-1=5$, $6-2=4$, $6-3=3$, $6-4=2$, $6-5=1$, $6-6=0$. When I took away the blocks, he answered that $6-3=2$, $6-4=9$ and $6-1=0$. So I gave him the blocks again, and he solved the problem $6-3=?$. He drew three strokes and added three more. He drew six tents and erased three. Drew a road with three trees on each side. Then I made him say $3+3=6$, $6-3=3$, $2\times3=6$, each one at least five times, and he finally learned these combinations. After four lessons, using similar drill each time, he has competency with numbers up to six, but he is not efficient enough with them to give an immediate correct answer.

He knew his alphabet and could recognize and make his letters. But he could not sound them. I sounded *b*, *f*, *r*, and *l*, and showed him the position of my mouth. After almost countless repetitions he learned to sound those four letters. But when I placed them separately before *ed* (a word he already knew) he was unable to synthesize, and finally I had to tell him the words fed, led, bed, and red. It was only by writing these words, spelling them aloud and with anagrams and drilling upon them many times that he finally learned them. By using the same method with all the unfamiliar words I have brought him to the point where he now can read the first four pages of "The Mother Goose Primer."

Among other things, John possessed a speech defect. He is a lazy, baby talker. I am working now with breathing and speech exercises. He is able to hold his breath now, can sound *e* for six seconds, *a* for eight and *o* for fourteen. At first he said the familiar rhyme: "Barber, barber ——" like this,

"Babor, sha a pi
How many wi make a wi
Four and twenty wi gi the babor a piece o' snuff."

The only speech gain he has made has been in learning to say this one rhyme correctly.

Having made the attempt to teach we are now in possession of enough material to give a fair basis for diagnosis.

John is, as his aunt says, *dull*. But what does *dull* mean? In this case, it means lacking in intelligence; that is, he is nearly always unable to solve what for him is a new problem. With him, it seems to be a general defect. Knowing the sounds of the letters, he can not synthesize and make a word. Seeing the cylinders and cylindrical spaces, it does not occur to him to make the former fit into the latter. He counts two rows of five and finds that there are ten. Yet immediately afterward he says that two times five are twelve. He can't copy the block design because he doesn't see that he needs sixteen blocks instead of four.

He doesn't solve the new problem. Why? If we analyze his performances we find that he is lacking in imageability, associability, and contracted particularization.

Furthermore, once the problem is solved, it is very difficult for him to learn the solution. There must be drill, drill, drill, and presentation in many forms. It takes many stimuli to bring about imagery adequate to survive.

Without a doubt, John is feebleminded according to Barr's classification. He is "backward or mentally feeble." His "mental processes are slow and require special training and environment to prevent deterioration."

But he can be taught—that has been proved—if one is willing to take the trouble. His conduct is conformed, and he has no marked somatic stigmata. He is patient and persistent and willing to try. I am willing to prognose that, with these assets, he can be trained for a place in the world. He will probably be able to learn to do simple, manual work and become self-dependent.

He can be taught simple reading, writing and arithmetic. Where? Certainly not in the schoolroom with a class of children!

John is a type of child for whom clinical teaching holds out the only hope. Individual instruction, attention to his special defects, special drill—this alone can give him what he needs.

DIAGNOSTIC TEACHING.

The Grading and Analytic Diagnosis of a Feebleminded Boy.

By L. Doris Wilcox,

Senior, School of Education, U. of P.

When Edward was examined at the Psychological Clinic this spring he was pronounced qualitatively feebleminded. The examiner noted particularly these defects: poor distribution of attention, distractability of attention, a limited imagination and a poor memory.

But the boy had good motor coördination, good judgment, excellent persistence and a fair amount of general information; and these facts led the examiner to wonder just how teachable Edward was. Was he trainable in manual and intellectual arts, or in manual arts and the simplest mental acquirements, or was he only trainable in the simplest manual and industrial occupations?

The best way of solving the question was by an attempt to teach. Accordingly, Edward has come for clinical instruction three times, remaining about an hour each time.

The boy is ten years old, well grown and well developed, but he is not very well. Has very poor vision, lacks energy, has adenoids and enlarged tonsils and bad teeth and has had a cold for about three weeks.

One of the first things I found out about Edward was that he knew no words or letters, printed or written. He could not even spell his own name. He counted to twenty-three but knew practically no arithmetic. He said that five less three are four.

It is interesting to note that Edward is in the 2B grade in school. His principal was not aware of the fact that he could not read or write anything nor even recognize letters. She said he was dull but was "not a bad boy." She remarked that he was in the second grade because the superintendent had required that if too many pupils in a grade failed to make a passing mark, some of them should be promoted on condition.

At the first lesson I attempted to teach Edward to print one word. I taught him to move his arm vertically and horizontally and to obey the commands: "Raise your right arm vertically *up*. Move your right arm horizontally to the right." As he knew left and right and had a memory span of five, this was comparatively easy.

Next, I gave him chalk and had him make horizontal and vertical strokes on the board. When he could do that, I said, "Make a vertical stroke." He did so.

"Make a horizontal stroke, at the bottom of that and to the right." He carried out the command easily.

"That letter is L." He repeated "L" and made four new L's.

"Now make a circle." He did so.

"That is the letter O." "What is it?" "O."

We drilled on O and reviewed L.

"Now make a vertical stroke. At the top draw a horizontal stroke, going both ways."

"That is the letter T." Apparently he learned T.

Then I put the letters together and told him he knew how to spell a word: LOT. He seemed delighted and wrote L O T all over the board. He said "L-O-T, lot," frequently as if he liked the sound.

Then I asked him to point to T. He pointed to L. When I pointed to L he called it O. He did not even attempt to name T.

I took a box of anagrams and selected L, O, and T and placed them before Edward, drilling until he seemed to know them. Ten minutes later he was able to spell and write L O T, but did not know the three letters.

In number work, I began by teaching him to count backward from six. When he could say, "1–2–3–4–5–6, 6–5–4–3–2–1," I reviewed $1+1=2$, $2+1=3$, $3+1=4$, $4+1=5$, $5+1=6$. All of these he knew fairly well before. Then $6-1=5$, $5-1=4$, $4-1=3$, $3-1=2$, $2-1=1$. He had difficulty in figuring that out, but when I gave him six blocks to work with and guided him by taking away one at a time, he finally saw the plan, and was able, after thinking a moment, to give the correct answer to any of these problems.

With the Witmer Formboard he did well. He had seen it once before while he was being examined. His first performance took twenty-six seconds. He made no errors. The second time he brought his record down to seventeen seconds, and on the third trial he put away every block correctly in fifteen seconds, which compares well with the records of the majority of normal children.

The following week Edward could write LOT, but did not know any of the letters contained in the word. He remembered none of the arithmetic I had taught him except the addition by one. I reviewed the entire lesson, and the boy seemed to learn it a little more easily than before.

In addition I tried some of the Binet material. With the pictures he gave an excellent enumeration and passed the VIII-year "similarity test," but failed on the VII-year "dissimilarity test."

The third week, when Edward came to the clinic, I gave him a sliced animal puzzle to put together. He manipulated the pieces futilely and finally gave up without any success.

He wrote LOT on the board and spelled it aloud, but did not know the letters. He could count backward from six, but could not subtract by one without blocks. The poor performance may have been partially due to the fact that Edward was suffering from a bad cold and a headache. He has been discharged from the clinic temporarily until his adenoids and tonsils have been removed and his physical condition has improved.

What has the clinical teaching accomplished? Principally it made possible a slight particularization of diagnosis. It has shown conclusively that Edward is trainable in manual and industrial work, and also that he is somewhat teachable in mental acquirements. We are justified in placing him above the grade of a low-grade imbecile.

Now the question is: Will he be able to learn reading, writing and arithmetic, or is he only capable of the very simplest mental acquisitions? Up to the present time it is impossible to say. The results are not conclusive, for the lessons have been too far apart, and Edward has not been in good physical condition.

In this case it will be seen that further clinical instruction is necessary both for the child's sake and for the sake of the diagnosis. As soon as Edward is in good physical condition, he will return to the clinic every day until a satisfactory answer to the question is found.

CANTON KALLIKAKS.

By Julia F. Randolph,
Teacher of Special Ungraded Room, Canton, Illinois.

"There are Kallikak families all about us."—*Goddard.*

This report is based upon a study of the families of ten pupils who have attended the Canton schools within the last twenty years. The records, while incomplete, tend to show the increase in the number of defectives and dependents among the descendants of sub-normal men and women, and the relation existing between defective mentality and economic dependence.

In making an investigation of this kind such expressions as "not very bright," "a little off," "not all there," "very peculiar" are often heard. The term "sub-normal" has been used where there seems to be no doubt of low mentality yet no positive proof of feeblemindedness. Those who have been cared for in state or county institutions, or supported by others than their parents, are called dependent. Persons who live at home and receive help from the county or from local charity are called partially dependent.

Some changes have been made in names and conditions to prevent identification. John is a feebleminded boy. One sister is at the state school for the feebleminded. John's father was sub-normal and drank to excess. When he died he left his family unprovided for, and four of the children were partially supported by the state through the mother's pension. John's grandfather was not considered "just right" by the neighbors and his great-grandfather was spoken of as "queer" and "peculiar." Members of this family for three generations have been backward in school work.

For years the county contributed to the support of the Jefferson family. Mr. Jefferson was sub-normal. Mrs. Jefferson was feebleminded and finally became insane. She was taken to the county home and later to the insane asylum. A feebleminded daughter, Marian, married a feebleminded man.

Pete Van Dusen has been in our ungraded room, and was at the state school at Lincoln for a short time. He is very defective and is in poor health. Pete's sister, Miranda, is feebleminded and his brother is at the state school for the deaf and dumb. Both Mrs. Van Dusen and her father are sub-normal. Mr. Van Dusen was reported "dissipated, shiftless and not very bright." He does not live with his family, and Miranda and her husband are separated.

Matthew Mildmary was defective mentally, but was capable of supporting himself. His grandchildren are a burden to society. Ned, after three years in the first grade was taken to the state school and colony for the feebleminded, from which institution he ran away eight times. Ned's father was a defective. Matthew's feebleminded daughter, Ella, married a feebleminded man who became an inmate of one of the state hospitals for the insane. Ella's oldest child is sub-normal and dependent. Her son Jim is at the state school for the feebleminded, and two other children were declared dependent by the court and placed in homes. Matthew's son, Peter, was killed by a train, and his wife married again. Her second husband, who was related to Mr. Reuben, was shot. The two children are in private homes. The mentality of one of them is doubtful.

Mr. Argum lived on a farm near Canton. He was poor and worked very hard. We know nothing of Mrs. Argum. Two daughters are feebleminded. Lulu married a feebleminded man who became an inmate of a state hospital for the insane. Lulu's son, Jacob, is feebleminded. Her daughter is too young to judge mentally. They are all dependent. Jane's husband belonged to an intelligent family, and of their children one is normal, one rather slow and physically weak, and the third is not old enough to judge of her mentality. Jane was separated from her husband, and, though she was able to work under supervision, she could not make a living for her children.

The families of Luther and Sam are connected by marriage, and one chart answers for both families. According to their neighbors, all the members of Luther's immediate family were sub-normal. His sister spent some time at the state school for girls. An older brother married Helen, a sub-normal girl whose early life was an eventful one. When Helen was a very young girl a middle-aged man, said to be "half-witted" persuaded her to marry him and go to another town to live. Helen was brought back to Canton, and the marriage was legally annulled. Then Helen was taken to a mission home supported by private charity. Sometime afterwards the man became an inmate of one of the state hospitals for the insane. Helen's brother was at the state school for boys. We know nothing of Helen's father, but her mother was sub-normal and married a very eccentric man for her second husband. The husband and three children were at one time in the county home, and later two of the girls were cared for at the mission home. Sam has been in the ungraded school. Both families have depended upon county help and local charity for partial support in addition to the institutions mentioned.

The story of the early life of Harriet was given by an old gentleman who was once her teacher. Many years ago there lived in Canton an immigrant family of low type. Mr. and Mrs. K. were "very peculiar," and Mrs. K.'s brother John was a sub-normal man. Their house was very dirty. Mrs. K. as well as the men drank to excess, and their standard of morality was low. Harriet, a little orphan girl of defective mentality, was taken into the K. home where she became the household drudge. When very young she married Tom, a neighbor boy. In later years Tom drank a great deal. Tom and Harriet had two daughters, both sub-normal. After several years of poverty and hard work Harriet finally ended her days in the state hospital for the insane. Hattie followed her mother's example and married a drinking man. Jonas was not able to take care of his children without occasional help from local charities. His relatives were dull and inefficient and depended more or less upon outside help. Two of Hattie's children, were considered subnormal by their teachers.

The family history of Jacob D. is a good illustration of the fact that dependence increases at a rapid rate in succeeding generations. Jacob was the only one of several brothers and sisters who was mentally deficient or dependent. Both of his wives were from families greatly inferior to his own in position and intelligence. Jacob's son Philip was killed by accident leaving a family of small children. Janet, a feebleminded daughter, became insane and was sent to a state hospital for the insane. Janet's husband was subnormal and could not support his family. In the third generation, Henry is feebleminded, Philip's three children are helped by the mother's pension, and Janet's three children are in homes kept up by the state or county. Jacob depended largely upon county orders.

The Reubenites lived in tumble-down shanties in the slum district. Mrs. Reuben has been married twice. Her son is at the state school and colony for the feebleminded, and her feebleminded daughter is said to be sexually immoral. The daughter's husband and son are deformed. Mrs. Reuben is feebleminded. Mr. Reuben was reported as alcoholic, and both Mr. and Mrs. R. have been in the county home. These people depend largely upon others for food, clothing and medical attention.

THE HENDERSON FAMILY.

The Social Level of a Group determined by the Clinical Field Service.

By G. G. Ide, Ph.D.,
Social Service Department, Psychological Clinic, U. of P.

The Henderson family live in New Jersey on a three-acre place two and one-half miles from a thriving town. The house is quite picturesque from the road, as it is surrounded by a hedge some ten feet in height. The house is roofed in red tiles and protected by trees. The only means of entrance to the yard is through a hole in the hedge, through which the chance visitor creeps with some loss of dignity and considerable wearing of temper. The house is faced on two sides with a broad porch, the floor of which lacks many boards and offers but poor means to escape from the dirt path. The door which opens from the porch lurches drunkedly on one hinge, the upper half entirely missing, and the room into which it opens looks as if it might also have been sharing in the orgy, if the testimony of broken and discarded furniture may be taken as evidence. Toward the rear, guarded by a gaunt yellow cur, not too unfriendly, the back door offered hospitality. The space around the door is bare of green owing to too frequent deluges of dirty water, but the kitchen, lighted only by the open spaces in a diamond-shaped window frame, did not offer any reason for the assumption that water was frequently seen there. Dishes half-washed and left in greasy dishwater, crusts of stale bread and other foods on the table, floor and stove, and dirt brought in from many feet accumulating on the floor, and objectionable odors on every side were the tangible evidences of a human dwelling. A garage, with the customary openings of broken boards, faced the road, while within stood a dilapidated Ford. In the back seat of this car, safely tucked in and ready for flight, sat Mother Henderson, Daughter Ru and the baby son. Lest they be forgotten on a contemplated trip, they were eating their lunch in the car, the lunch consisting of very unpalatable looking chunks of bread and pickled fish, the two-year-old son indulging like the rest.

The daughter, Ru, a pink-cheeked, good-looking child of twelve is the only girl with whom Mother Henderson has had "any luck." In fact, she is one of five reared thus far, while five other children lie on the hill just above the house, victims of "summer complaint," to which it seems likely the last little son will likewise prove a victim. The eldest son of the family is fifteen years old, heavy and husky. He finished the sixth grade in a country school and is now working in a garage as errand boy. Two other sons, ten and eight respectively, are in the first grade in a consolidated school. Neither will pass this term into the second grade, for they are absent a great deal, and the younger does not seem strong enough to cope with the problems he is meeting in school. The older boy is stolid and healthy, able to hold his own in the world, if not in school. The girl, Ru, has never been entered in school, because she did not learn to talk until she was eight years old, and now, at twelve,has a vocabulary which does not exceed one hundred words and an infantile stammer as an added handicap.

Ruth was brought to the Psychological Clinic at the University of Pennsylvania in Philadelphia, at the behest of relatives. Her characteristic attitude while there was an up-raised arm in an attitude of defense and a loud whining "Let's go." She stamped her foot and demanded of her mother protection, which latter did not move the mother to come to her aid. Ru refused to "play" with the examiner most of the time. Her face was usually drawn into a troubled frown, but on command she would smile for a moment. The simplest mechanical test was beyond her power. Her memory span was three, with echolalia on the final word or syllable for which she was asked. Questioning the mother did not bring out much information, as the mother was too much in doubt herself to answer questions intelligently. For instance, she could not give her home address or directions how to get there. She did not know her children's school records, and her statements in regard to her children's history were very, vague. The father a shipyard worker on occasions, was certain that Ru remained about the same, neither excited or melancholic, at intervals. He thought her attitude of defense brought about by a great deal of teasing on the part of her brothers and cousins living nearby. She ought to go to school, he admitted, but he would not want her to leave home.

Mr. Henderson is an easy-going sort of man, little worried by the conditions which he faces at home. He thought his strawberry bed needed fixing up this year, and did fix it up—by plowing a furrow between the rows. He planted a small garden, principally with onions, and left the rest of his three-acre plot to grow up to weeds. His car has lost several floor boards and sundry bolts and straps, but these, together with a leaky and very much patched tire, did not move him to use some of his leisure time to their mending.

The conditions in the house are seldom equaled in a city slum, and the general response of the mother, if her success as a homemaker and mother are used as a standard, are those of the feebleminded type. Her tiny son, long past two, does not walk or talk, and shows no inclination to do so. The next son is very dull and in poor health. Two years in school have failed to teach him anything of first grade work. The next son is very dull and slow, and mentally deficient in the sense of not being able to do well in school work, but his reactions among the other children are normal for his years. Ru is unquestionably feebleminded and of low grade.

The family is not a hopeful one from the standpoint of their probable value as a social unit. Ru will soon be of an age where she will be a menace to society, and the feebleminded mother is not strong enough to be of value as a disciplinary agent. The father is not at home when he can be a member of some jolly party in town, and if there, would not understand the problems to be solved. The conditions in the home are not favorable to the physical development of the two younger children. The entire family are not at the present time, or likely to be in the future, productive members of the community.

"DICK": A CASE OF ATAVISM.

A clinical lecture reported by the recorder of the Psychological Clinic.

The following list of physical anomalies will show immediately that Dick is an obvious case of arrested development. He is microcephalic; at nine years his head girth is 47.1 cm., the minimum for five years being 50.37 cm. His ears are a-symmetrical. He has a cleft palate, the extreme opening of the fissure being three-eighths of an inch. The uvula is missing. He is unable to open his mouth for more than about an inch, as he does not use the proper muscles for this purpose. His hands are also most significant. The boy was born with one thumb attached to the third joint of the first finger, and this was removed by operation. On the other hand the thumb does not resemble that of a human hand, but rather that of one of the apes, and it is not opposible, except occasionally. He grasps with all of his fingers as a unit, instead of using them separately as does a human being.

His performance level with the tests just made is about eighteen months. This does not mean that his performance is that of a normal eighteen-months-old child. This is not a case of simple retardation. The boy is qualitatively feebleminded. He is able to pick up a block and put it into one of three similar spaces, as with the Seguin Circles A, but he is unable to make a choice between three slightly dissimilar spaces, as with the Seguin Circles B. He apparently did learn to do the three-block formboard, but his memory is not retentive as appears from the fact that when he was given this same test after a brief interval he failed to do it. There is no evidence that his reactions are above the level of senso-motor reflexes. He shows no imageability, no associability, and no attention as we usually use the word. He is, however, not at all like the Mongolian in attention. He is too lethargic to give a typical Mongoloid performance. His parents say that he has never been a troublesome child, and this is no doubt true. The fact is that he is probably too lacking in energy to have any initiative. This brief analysis shows that his behavior is in no sense that of a normal eighteen-months-old child—in other words he does not conform in behavior to the type of a normal child of that age or of *any* age.

This non-conformity does not show in his moral conduct, he is not brutal or destructive, and there is certainly no evidence that he has immoral or criminal intentions. There are no symptoms of dementia or emotional disorder—it is not a case of insanity. The sort of non-conformity to type which we find in this child suggests atavism, *i. e.*, retardation on the species scale. He isd efinitely a case of incomplete uterine development—witness the cleft palate, the missing uvula, the microcephaly, and the non-human hand.

The mother gives as a possible cause, an injury due to breech presentation at birth, but the child bears upon his body definite proofs that the trouble is of earlier origin than that, and is to be sought for either in heredity or in an arrest of uterine development. The mother reports a fall in the third month of the period of gestation, and it is possible that this may have produced a tendency to, or an incomplete, miscarriage, the result being this monster. The parents absolutely deny any attempt at abortion. There is no other child. This latter fact may be of significance as it is just possible that the trouble in Dick's case may be due either to an attempt at abortion, resulting from a lack of desire for children, or to a lack of procreative energy in the mother. In the latter case the lack of procreative energy may have caused mal-nutrition in utero, and therefore a child monster. It is, of course, possible that the cause is syphilis. The family history given by the parents, both of whom seem perfectly normal, and in fact rather intelligent, is absolutely negative as regards etiology.

Whatever the cause may be, this child is a case of arrested development, on the species scale an atavistic monster and on the growth scale an idiot.

NEWS AND COMMENT.

Malnutrition and Health Education.

Dr. David Mitchell, Bureau of Educational Experiments, presents the report of an interesting experiment in the conduct of "Nutrition Classes," which was carried out in the P. S. 64, Manhattan, New York, for four months beginning with February, 1918. The first step in such an experiment is concerned with determining the condition of the children to be observed. Scales and measuring rods were the equipment, and the results obtained showed that an average of 16.8 per cent of all the children examined were 7 per cent or more under the weight which they should have been for their height. If the condition of malnutrition exists in such proportions the reasons behind it must be reached and eliminated. Investigation showed that it was not only the lack of proper food that made for malnutrition, but the manner in which the food was eaten, as well as the use of stimulants such as tea and coffee, eating too rapidly or when over fatigued, eating between meals, irregularity of meals and insufficient sleep.

Malnutrition is also a product of physical defects. The condition of the teeth and the removal of any naso-pharangeal obstruction must be attended to before improvement may be looked for. Insufficient rest is another condition that must be considered, for the child's digestive organs do not function properly when the body is over-tired. It was suggested that food given in smaller quantities and at more frequent intervals would prove of more benefit to the child, and that, above all, the proper and best food be procured. With these conditions as the primary causes of malnutrition carefully considered it was decided to organize six nutrition classes which would be governed by rules providing for the elimination of one or more of the conditions which were considered factors leading to malnutrition.

The children in the different classes were not only given good food in the proper quantities, but they were instructed in health habits as well. Teeth were examined and defects corrected. Wherever the consent of the parent could be obtained adenoids and tonsils were removed. Rest periods were included in the daily program, and a daily chart of the child's progress was kept on which was noted the increase or loss of weight as well as the rest periods indulged in or the number of lunches and dinners taken each day by the child.

The co-operation of the child was necessary in order to obtain satisfactory results, and so the classes were organized in a way that would appeal to the desires and aims of the children. The nutrition class worked on the assumption that every girl wanted to be attractive and beautiful and that every boy wished to be athletic. In order to bring about the necessary competition various methods were used. One of the most important of these is the use of a chart. The name of the child is printed in large letters and then his age, grade, original height and weight are recorded. Along with this are given his normal weight and the number of pounds and per cent underweight. The chart is arranged to contain the results of thirty meetings of the nutrition class. In a column corresponding to each meeting the weight of the child on that day is recorded, and the line of normal weight indicated by a heavy line. The child records the number of calories which he takes each day. If the morning lunch is taken and the mid-morning rest is observed these items are marked in the proper place by a red and blue star respectively. In much the same way the child keeps his own record of his physical defects. The number of teeth defective is recorded each day and as the defects are removed the number decreases until the line becomes clear. If a child requires an operation for adenoids and tonsils a black seal is placed in the column on the day when the defect is detected, and each week until the operation is performed another black seal is added to the chart. In like manner the use of tea and coffee is noted. Each week the number of days on which the child has partaken of these drinks is recorded, and the line of record becomes clear and white only when these stimulants have been eliminated from the diet list. For the helpful factors such as resting, normal feeding and proper food the aim of the child is to get a star or a large number each week. For the detrimental factors included in the list of physical defects the aim is to eliminate the black marks and have a clear record all across the chart. The charts are arranged on the wall of the class room, at one end the chart of the child who has made the greatest gain since the previous meeting of the class and at the other end the chart of the child who has gained the least or lost the most. To the first chart a gold star is attached. The children arrange themselves in the classroom according to the order of their charts. The children are instructed in health habits, and the cause of the gain or loss of weight is explained, and the factors which make for better health conditions discussed.

What and how to eat is sometimes stressed, although no attempt is made to change the diet of the family. The child is thus educated in matters of personal health and hygiene, in the reason for eliminating certain things and for the observance of certain other things.

The results obtained from the methods of procedure, already outlined, show that the total gain for the children in Grade 7 was 72 pounds, the expected gain for the period of about nineteen weeks while the children were in the nutrition classes was 64.8 pounds. The net gain made by the children was therefore 7.2 pounds. The percentage of gain in excess of normal is 11.1. The children in Grade 6 for a similar length of time gained 109 pounds, which is 18.1 pound more than the expected gain of 89.9 pounds for the period. The result for th other grades is much the same, and the experiment showed that the prope food, rest, habits of eating, and sufficient incentive to carry out health and hygienic rules will overcome the bad effects of malnutrition.

The School Board Service Division.

In connection with the Bureau of Education in Washington, D. C., there has been organized a School Board Service Division, the purpose of which is to supply vacancies with suitable teachers. The services of the School Board Service Division are without cost either to the teachers or to school authorities. Commissioner of Education Claxton says, in explaining the services of this department: "We wish especially not to disturb teachers who are both happy and satisfactory in their present position. By far the larger per cent of teachers will remain, and should remain where they are. Frequent changes are not best either for the welfare of the school or for the reputation of the teacher. Nevertheless vacancies will arise and worthy teachers will desire to change places. In both such cases we desire to be of the greatest possible assistance."

Registration blanks may be obtained through the Department of the Interior, Bureau of Education, Washington, D. C.

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